THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

CLIMATE ACTION COMMITTEE MEETING

OF THE VILLAGE OF LIONS BAY
HELD ON WEDNESDAY, JUNE 2, 2021 at 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY
AND VIA ZOOM VIDEO CONFERENCE

TO JOIN THE MEETING, CLICK HERE: https://us02web.zoom.us/j/89284755683
TO JOIN VIA PHONE, DIAL 778-907-2071 AND ENTER MEETING ID 892 8475 5683

AGENDA

1. Call to Order

2. Appointment of Recorder

3. Approval of the Agenda
THAT the agenda be adopted as submitted.

4. Public Questions & Comments

5. Approval of Minutes

A. Minutes from the May 13, 2021 Climate Action Committee Meeting **(Page 3)**
THAT the May 13, 2021 Climate Action Committee Minutes be approved, as circulated.

6. Business Arising from the Minutes

A. Outcome of Committee Recommendations to Council from May 13, 2021 Regular Council Meeting – For Information **(Page 10)**
Council would like to see a draft letter of recommendation and more information prior to approving the letter of support for the Help Cities Lead campaign.

7. Unfinished Business

C. OCP Amendment and Associated Targets –

D. Resident Survey –

E. Climate Action Plan – On hold

F. G. Weary: Natural Asset Inventory – information report

G. Climate Action Tool Kit –

H. C. George: Renewable Diesel Fuel use by Works Yard – Renewable diesel information requested from staff – next steps towards feasibility of adoption

I. Transfer Station – materials WCS will not pick up

J. Solar panel on Municipal buildings – Jon to get an estimate from an expert

K. EV charger initiative and status – information report attached **(Page 22)**

L. Food truck power – Application for food trucks has been developed, which requires food truck to outline how they plan to mitigate impacts.

M. Beach Event power

N. Baseline Village data – GHG baseline data report from staff attached (presented at the May 25, 2021 regular Council meeting) **(Page 88)**

O. Village actions to date – same as above

P. Small community energy efficiency upgrade grant/loans

Q. Infrastructure improvements

R. Communication/Education

S. Finance/Funding

8. New Business

T. J. Povill report on Socio-hydrology of "artificial glaciers" in Ladakh, India **(Page 96)**

9. Correspondence

i) T. Brandvold – For Information **(Page 108)**
ii) MP Weiler re: Green and Inclusive Community Buildings Program – For Information **(Page 109)**
iii) Forest Enhancement Society of BC Update – For Information **(Page 110)**
iv) Sierra Club re: Invitation to webinar "Intact Forests, Safe Communities" June 9th **(page 111)**

10. Public Questions & Comments
11. Adjournment
12. Next Meeting - TBD

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

CLIMATE ACTION COMMITTEE MEETING

OF THE VILLAGE OF LIONS BAY
HELD ON THURSDAY, MAY 13, 2021 at 7:00 PM
COUNCIL CHAMBERS, 400 CENTRE ROAD, LIONS BAY
AND VIA ZOOM VIDEO CONFERENCE

MINUTES

In Attendance:

Committee Members:	Christina Lee Clara George Greg Weary Jaime Cunliffe Jon Povill Rebecca Loyo Mayo
Staff:	Peter DeJong, CAO Pamela Rooke, CFO
Public:	3

1. Call to Order
Norm Barmeier called the meeting to order at 7:01

2. Appointment of Recorder
Norm Barmeier was appointed as the recorder.

3. Approval of the Agenda
Moved/Seconded
THAT the agenda be adopted as submitted

CARRIED

4. Public Questions & Comments

Public presentation: Will Cole-Hamilton has been working on a campaign called Help Cities Lead. Did a short slide show presentation. Expanding authorities of cities with respect to enabling them to make environmental decisions around buildings etc; ultimate goal is reducing GHGs. 5 key policy tools could help communities meet 2030 and 2050 GHG reduction targets. Three of the policies were included in two Provincial Minister's mandate letters. Practical example: home retrofits through PACE can be financed through low interest long term loans secured against homes and administered by the municipality.

Follow up action: A copy of the presentation will be provided to Councillor Cunliffe for circulation to the CAC.

Lots of communities endorse the campaign. Looking for endorsement from Lions Bay. **helpcitieslead.ca** has information that could be useful to Lions Bay.

RS informed committee that this was brought up at the Howe Sound Community Forum and West Vancouver, Bowen, Squamish, Gibsons and Whistler have supported.

Question for the Mayor, has Metro Vancouver endorsed the campaign? He believes it did.

Public comments: NA question: GHG versus energy efficiency, is the common thread energy source? Step code focuses on fuel, but doesn't get us all the way. Lions Bay doesn't have natural gas.

RS suggests we consider supporting this campaign.

Councillor Cunliffe made motion to advise council to support campaign. RS seconded.
Moved/Seconded
THAT the Climate Action Committee recommends to Council THAT Council supports the Help Cities Lead campaign and THAT Council directs staff to provide a letter of endorsement on behalf of Council for the campaign.

CARRIED

RLM is suggesting we focus on action as well but supports endorsing the campaign.

Action = Recommendation to council: CAC to recommend to council that we provide letter of endorsement for Help Cities Lead campaign.

Public comments: NA comments about agenda. Feels CARIP report will be no longer, feels negative about this. Observation is that LB did minimum in terms of CARIP, to no ones fault. NA hopes that whatever we sign up for next has more political support and more action. Comments on clean diesel. How do we get a benefit that's more direct instead of paying $6,000 adder on renewable diesel.

Public comments: Mayor McLaughlin would like to thank the committee. Supports committee and supports efforts on the current and future agenda. Looking to supporting the CAC.

5. Approval of Minutes

A. Minutes from the April 15, 2021 Climate Action Committee Meeting
Moved/Seconded
THAT the April 15, 2021 Climate Action Committee Minutes be approved, as circulated.

CARRIED

6. Business Arising from the Minutes

A. Report from CFO Rooke – CARIP Report
CFO Rooke presented on:
Latest update is that the Minister has cancelled the CARIP initiative.

Walked through history of CARIP reporting, in 2011 Ministry required GHG reporting but it was too intensive for a small municipality and was not done for a few years. The reporting relaxed a bit in 2015 and we see the refunds year by year in report. It is the opinion of CFO Rooke this was a counterproductive refund strategy, the more carbon you spend the bigger the refund. RS opinionated that is not the point.

RS looking for clarification on grant refund value, Village got 100% of the carbon tax it spent back on the years they filed claims, ie reported. Village filed no claims from 2012 – 2015 because it may have been the case the CFO at the time it would have cost more to complete the report file claim than refund was worth.

Action = none, for information only

7. Unfinished Business

C. OCP Amendment and Associated Targets – report going to Council from CAO on May 25, 2021

GW was asking about updating the OCP to add "climate adaptation" similar to CAC committee terms of reference.

PDJ informed that no OCP amendments are planned for May 25th, but rather report against actions listed in current OCP. The report will be focused on current OCP goals.

Highlight to CAC – staff is working on producing report on actions taken to date against GHG initiatives listed in current OCP.

D. Resident Survey – Address after 25th – RS was asking for clarification on comments regarding staff's actions.

NB recommendation is to wait until after the 25th council meeting.

E. Climate Action Plan – Ruth can provide examples from other communities, this should be on hold until we get to low hanging fruit – **no report.**

F. G. Weary: Natural Asset Inventory – **no update at this time due to technical difficulties connecting to the meeting.**

G. Climate Action Tool Kit – **defer to next meeting or as resources are required.**

H. C. George: Renewable Diesel Fuel use by Works Yard – For Information

i. Benefit is there is no fossil fuel extraction and GHG reductions are achieved immediately. Theory is it is a cleaner burn, no BCIT data to support. CG feels this is low hanging fruit and could be an easy adoption, as no new tanks are required and can be mixed with existing fuels. Cost higher than typical diesel.

Action = CAC to look into possible grants to offset renewable diesel premium.

ii. Need to see if the Village is in a contract with Super Save Fuels, often very long contracts.

Information update from CFO Rooke indicates she does not believe the Village has a long-term contract to impede renewable diesel adoption.

iii. JP would like to see fleet conversion to electric.

iv. CG does not have a good inventory of what is running on diesel, so it's difficult to see what could be converted to renewable fuel energy.

v. PDJ informs we have a fleet of new vehicles as well as heavy equipment such as backhoe and skid steer, as well as backup generators.

vi. PDJ would need to confirm if warranty would be void. CG explained the fuel can be mixed with existing fuels and will not void any warranties. PR feels we do not have to worry about a long-term contract, has initiated inquiry with OEMs on warranty.

vii. Walt Disney converted all their theme parks and City of Vancouver and film industry are using this fuel.

Action = CAC to either request an inventory of fuel burning equipment from staff or start by looking through Asset Management plan reports available on Village website.

For CAC to get staff time on this work a recommendation would need to be made by CAC to council for additional staff time.

No formal request for staff time was made for this activity.

Meeting extended to 8:15

RS feels CG report is great information. Let's calculate how much more efficient the fuel is to justify cost differences.

RS raised the point that to reduce fuel consumption and GHG emissions unnecessary idling is an easy solution. A reminder to staff about the current bylaw.

CG informed CAC that there is a device that will monitor and report idling. Just having the device on the vehicle reduced idling behavior.

RS suggested we look into grants to offset the cost of renewable diesel. Councillor Barmeier volunteered to research grant options for next CAC meeting.

Review action, staff to look into fuel supply contract as well as OEM warranty impact on use of renewable diesel as a substitute to conventional diesel.

JC offered recommendation of no idling.
PDJ reported that PW Manager states average allowable is two minutes.
RS informs Village bylaw is 2 minutes.

CG asked if we could get inventory of all fuel burning equipment, type of fuel, and take that forward to see what could be substituted. CG recommended we look into Clean BC grant funds. CG informed there are grants out there to electrify infrastructure.

Action = CAC to calculate how much more efficient renewable diesel is over conventional diesel. Unclear specifically who will take this action.

Action = CAC to look into bundling opportunities. Unclear specifically who will take this action.

Action = CAC to understand cost of anti-idling device. CG to report back to CAC on cost and logistic of anti-idling device.

I. Transfer Station – materials WCS will not pick up – Village enrolled in Recycle BC program that will pay us for our recycling.

Due to time constraints no update to balance of unfinished business. RS suggested we add correspondence from this meeting to unfinished business of next meeting.

J. Solar panel on Municipal buildings – Jon to get an estimate from an expert

K. EV charger initiative and status

L. Food truck power – Application for food trucks has been developed, which requires food truck to outline how they plan to mitigate impacts.

M. Beach Event power

N. Baseline Village data – part of CAO's report to Council that will go on the 25th

O. Village actions to date

P. Small community energy efficiency upgrade grant/loans

Q. Infrastructure improvements

R. Communication/Education

S. Finance/Funding

T. **Correspondence for May 13th meeting.**

8. New Business

A. Download of GHG inventory activities to date – update coming at May 25th council meeting.

Update: staff to present report at May 25th council meeting.

B. R. Simons – verbal update on Help Cities Lead – For Information

Action: Councillor Cunliffe to take CAC recommendation to council to endorse HCL.

C. J.Povil – watershed management

Action: Unclear what follow up is requested here, CAC needs to do more research on this ask. Unclear who is taking this action.

9. Correspondence

A. T. Brandvold – For Information
B. MP Weiler re: Green and Inclusive Community Buildings Program – For Information
C. Forest Enhancement Society of BC Update – For Information

10. Public Questions & Comments

NA appreciates meeting, feels reaching out to public may be more effective. Could we ask staff to add anti-idling bylaw to scope of bylaw enforcements job.

Action: Councillor NB to bring recommendation forward at next CAC.

11. Adjournment

Moved/Seconded
THAT the Climate Action Committee Meeting be adjourned.

CARRIED

12. Next Meeting – June 2nd, 7PM

MEETING ADJOURNED AT: 8:21 pm

DATE APPROVED BY COMMITTEE:

HELP CITIES LEAD

Enabling Local Government Climate Action

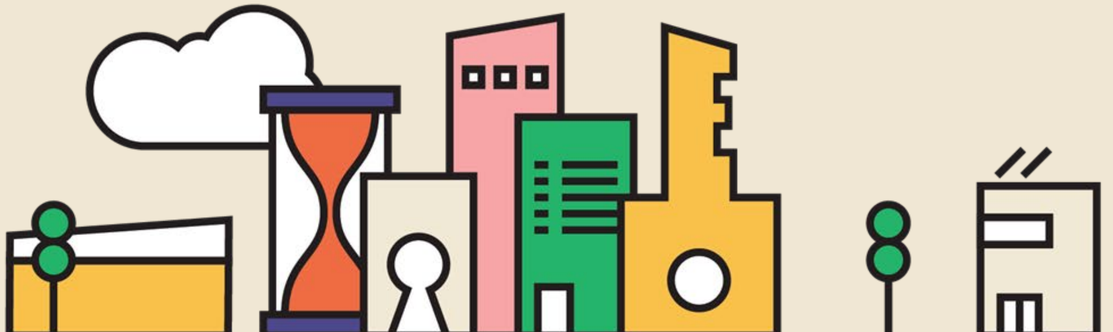
May, 2021

Who we are

HELP CITIES LEAD is an education and awareness campaign to build support for more focused collaboration between the Province of British Columbia and local governments on building climate policy. The group is a coalition with Climate Caucus.

We have developed and modelled a suite of 5 policies which would have a dramatic impact on GHG emissions related to buildings.

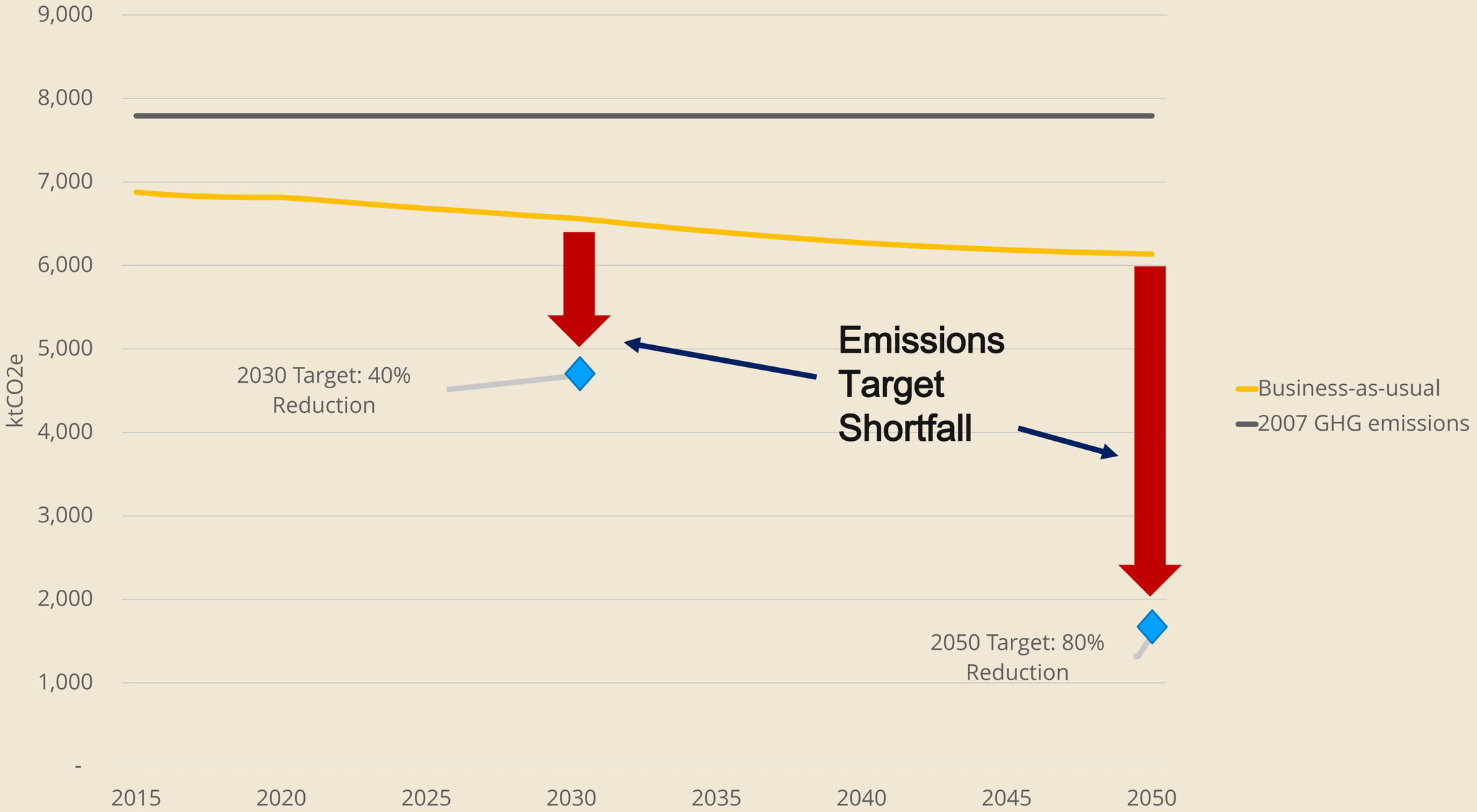
In the last three months we have received formal endorsement from 30 local governments throughout BC from Kitimat to Vancouver.



Buildings are responsible for 40-60% of community GHG emissions for local governments in BC.

Local governments in BC have very few tools available to significantly reduce GHG emissions in buildings.

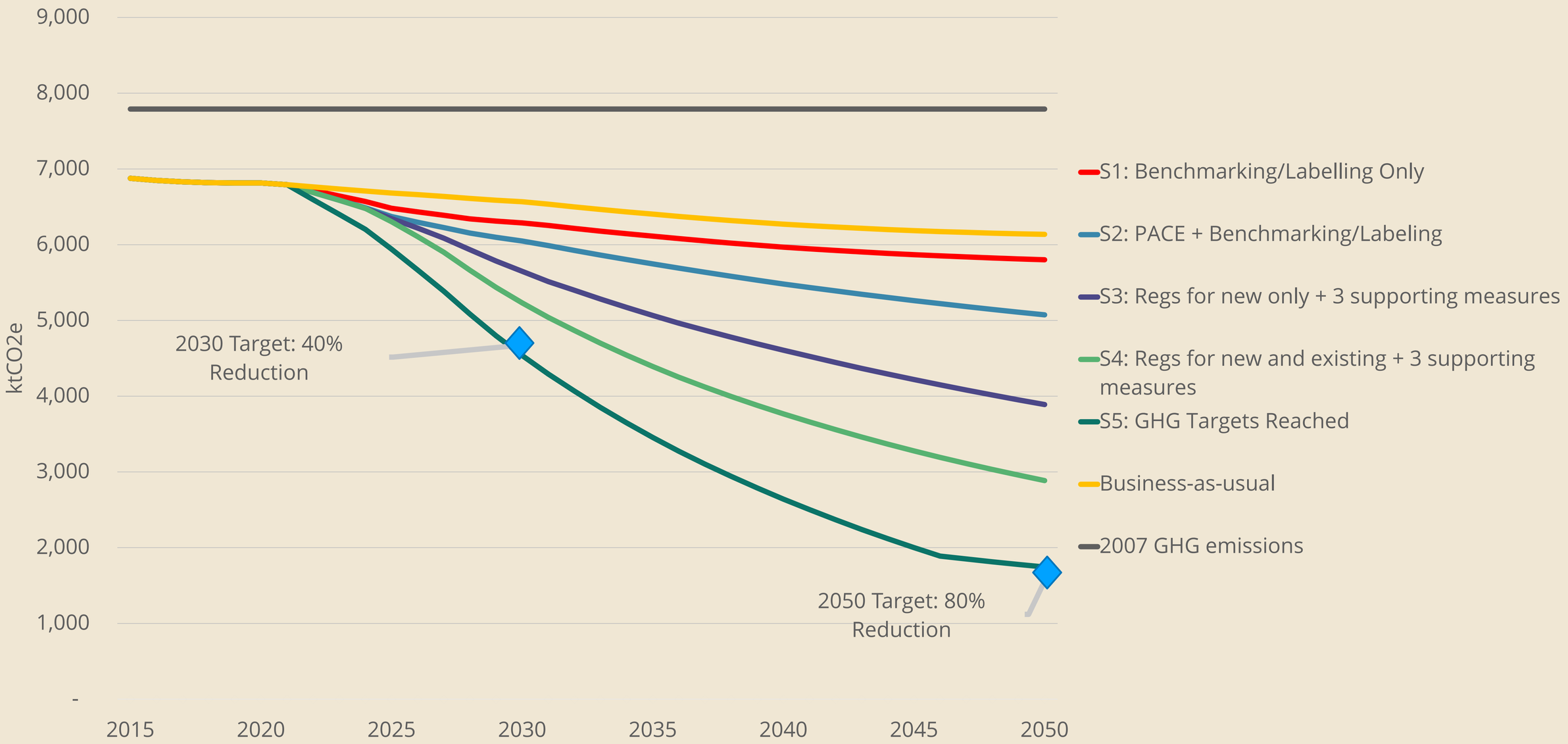
Business -As-Usual Scenario – Building Emissions BC



The 5 Key Policy Tools

1. Regulating GHGs For *New* Buildings
2. Mandatory Home Energy Labelling
3. Property Assessed Clean Energy (PACE) financing
4. Regulating GHGs For *Existing* Buildings
5. Building Energy Benchmarking

Modelled Impacts of Five Key Policy Tools



Actions Included in Mandate Letters

1. Regulating GHGs For *New* Buildings
2. Mandatory Home Energy Labelling
3. Property Assessed Clean Energy (PACE) financing

Actions with No Provincial Policy

4. Regulating GHGs For *Existing* Buildings

5. Building Energy Benchmarking

Our request to the Provincial Government

1. Proceed with implementing the **three actions included in Mandate Letters** as quickly as possible

2. Adopt and announce a policy to include a **GHG requirement in the BC Retrofit Code** (Minister responsible for Housing)

3. Adopt and announce a policy to enable local governments to require **energy benchmarking** and support its implementation by local governments

Local Government Endorsements to Date

City of Vancouver

Village of Cumberland

Town of Gibsons

District of Highlands

Town of Ladysmith

Municipality of North Cowichan

District of North Vancouver

City of Rossland

District of Summerland

Resort Municipality of Ucluelet

District of Squamish

Town of Comox

City of Fernie

Town of Golden

District of Kitimat

City of Nanaimo

District of North Saanich

City of Powell River

District of Saanich

City of West Vancouver

City of Victoria

Metro Vanouver

City of Port Moody

City of Courtenay

District of Oak Bay

Bowen Island Municipality

Township of Langley

City of Maple Ridge

Town of Sidney

Resort Municipality of Whistler

City of New Westminster

City of North Vancouver

With more endorsing soon!

helpcitieslead.ca

HELP
CITIES
LEAD

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

Type	**Information Report**		
Title	**Lions Bay ZEV initiative – update**		
Author	**Norman Barmeier**	**Reviewed By:**	**Peter DeJong**
Date	**May 21, 2021**	**Version**	**0**
Issued for	**May 25th regular council meeting and June 2nd CAC meeting**		

Recommendation:

THAT the Information Report, "Lions Bay ZEV initiative – update" be received.

THAT council direct staff to support ZEVIP grant application and aim to submit before the June 22, 2021 deadline.

Attachments:

(1) March 19, 2019 – initial motion to support DC fast charger in Lions Bay
(2) May 3, 2019 – VU article on DC fast charger initiative to garner resident feedback
(3) May 14, 2019 – resident feedback from correspondence
(4) June 23, 2020 – EVAFIDI grant submitted with budget support
(5) Sept 22, 2020 – Information report on revenue potential of 1 DC fast charger
(6) Dec 15, 2020 – location move to reduce potential capital cost
(7) April 7, 2021 – council priorities to pursue ZEVIP grant opportunities
(8) May 4, 2021 – ZEVIP grant opportunities verbal update from staff
(9) EVAFIDI eligibility criteria – relevant to original scope; EVAFIDI is closed
(10) ZEVIP – grant information
(11) CleanBC go electric – grant information

Key Information:

What is the project about?

Reducing GHG emissions by installing DC fast electric charging capacity near municipal hall.

Photo credit: Fast charging station in Squamish B.C., LeadingAhead Energy, 2020.

Do we have a mandate?

Yes, federally through NRCAN and federal GHG emissions reduction targets, provincially through cleanBC go electric program, municipally through resolution and OCP alignment, budget allocation, and resident support.

How will we pay for this?

Federal grant - ZEVIP, provincial grant - cleanBC go electric, with a stacking potential from NRCan and BC Ministry of Energy of 75% of total project cost to a maximum of $75K per charger.

Can the project generate revenue for the Village?

Yes. (attachment 5) as well as potential for carbon credits down the road.

What was the original scope of the project?

208v 3-phase power supply from BC Hydro located by pole near municipal hall to a meter and distribution kiosk, and finally to one (1) 50 kW DC fast charger.

Has there been scope creep?

Yes. Technical requirements, project delivery model, and funding criteria.

What can we do?

We can evaluate the technical scope creep, we can challenge the delivery model, however we cannot adjust federal or provincial funding criteria.

What part of the technical scope can we challenge?

Boilerplate turnkey packages will have been valued engineered to meet the highest municipal standards, standards which are likely based on for example, Metro Vancouver municipal criteria. Standards that may be saddled with technical requirements that are not relevant to Lions Bay. The requirement for a large BC Hydro transformer, and the need for a large heated and enclosed metering kiosk are also likely based on the highest standards, which could include oversizing the power supply, and over specifying the kiosk and civil works for future expansion. There is an opportunity for value engineering by shopping this project around in a public RFP with possible elements of self performance.

What part of the delivery model can we challenge?

Turnkey (boiler plate) versus self-perform with value engineering. Municipal purchasing and contracting policies may be adding unnecessary financial and technical burden to a simple project. There is potential capital saving in self performing design with local qualified professionals, construction management by staff, and possible civil works elements of the

project using public works skills and resources. Once we win a grant we have up to 2 years to start executing the work, there is no schedule pressure.

How has the funding criteria affected scope?

Original EVAFIDI grant was based on a single 50 kW DC fast charger. The current ZEVIP grant requires two (2) 50 kW DC faster chargers. This additional electrical load requires a larger and more expensive transformer and some additional civil work.

Project narrative - How did we get to where we are now:

Council approved the investigation of fast EV charging infrastructure in the spring of 2019.

A preliminary plan was developed and used to support an EVAFIDI (Electric Vehicle and Alternative Fuel Infrastructure Development Initiative) grant application which was submitted in July 2020 with a project budget estimate of $100,000 ($25,000 VoLB).

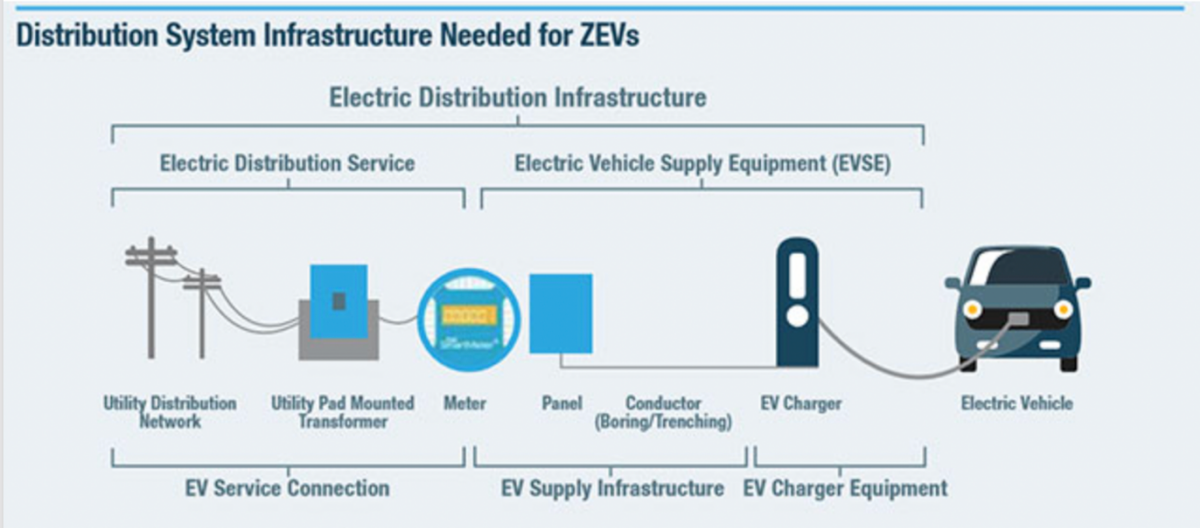
The federal EVAFIDI grant program started in 2016, ran for 4 years, and the last intake was July 2020. We were unsuccessful in this last round of grants. A debrief meeting with the granting agency afterwards revealed the program was heavily oversubscribed in its final year and winners were generally applicants in northern and central provinces, and applicants that filled the “65km” gap criteria. The overarching goal of the NRCAN program was to cast a national net of EV fast chargers no more than 65km apart. Lions Bay did not fit that one specific criteria since the lower mainland already has a lot of charging infrastructure. We scored high on proximity to a major artery as well other evaluation criterion, including proximity to multi-family dwelling units (MFDUs), places of employment, and retail. In addition to supporting GHG reduction EVAFIDI looks to promote EV adoption in MFDUs, work related commuting, and economic development in general. Our proposed location meets all of these criteria.

Council has given staff the mandate to explore another grant under the recently launched Zero Emission Vehicle Infrastructure Program (ZEVIP). The program is a 5-year $280 million program ending in 2024. ZEVIP has several application streams. Currently the proposal scope must include either two (2) fast chargers at minimum 50 kW each or a minimum of twenty (20) chargers at all charging levels. An opportunity to partner exists in the second scenario.

The requirement for two (2) fast chargers is resulting in project scope and budget creep.

Technical scope creep, changing grant requirements, and inflation, unfortunately seem to be putting this project out of reach for Lions Bay. The following table summarizes the initial scope and the capital budget projected in 2019, and seeks to present alternative project delivery options.

The figure below illustrates a typical configuration:



Turnkey (boiler plate) packages offer a typical arrangement of infrastructure from the utility pole to the point of use and are designed to meet a broad range of customer needs. Initial feedback from turnkey providers indicates a budget well beyond what we had originally planned for.

We need to understand why turnkey packages are so expensive.

A review of technical requirements, options, and costs:

One of the main cost unknowns is the BC hydro transformer. One (1) 50 kW charger is roughly equivalent to the maximum power demand of a single-family home. Initial estimates from BC Hydro suggest the required 3-phase power supply could cost roughly $25,000 with no real

indication of capacity. A formal application to BC Hydro will firm up the actual cost. The applicant (Lions Bay) receives a cost estimate without any commitment to proceed, however this can take several months to a year.

Further to the BC hydro transformer it would be prudent to let a public RFP with the basic project requirements to attract local contractors and vet bids against turnkey package pricing.

The following table outlines original budget, turnkey package pricing typically based on a boiler plate design, including contingencies and design costs (possible specifications beyond Lions Bay requirements), and alternative project delivery budgets with some elements of self-performance and a focused scope customized to our specific needs.

Date	Scope	Grant name	Grant funding	Budget estimate	Village contribution	Funding gap	Cost per connection
BASELINE HIGH LEVEL BUDGET ESTIME TO KICK THE PROJECT OFF – BASED ON COMPARABLE PROJECTS							
2019	1-50kW charger, meter, panel, 75kVa transformer	EVAFIDI	75%	$100,000	$25,000	$0	$100,000
TURNKEY PACKAGE PRICE ESTIMATES – DESIGN, CONSTRUCTION, CONTRACT MANAGEMENT							
2021	2-50 kW chargers, large kiosk, large transformer	ZEVIP	75%	$$$$$$$$	$25,000	$$$$	TOO HIGH
2021	1-50 kW charger, large kiosk, small transformer	Clean BC	50%	$$$$$$	$25,000	$$	TOO HIGH
SELF PERFORM PROJECT DELIVERY MODEL ESTIMATES – SIMPLIFIED TECHNICAL SCOPE*							
2021	*1-50 kW charger, meter kiosk, 75 kVa transformer*	*Clean BC*	*50%*	*$$$$$$*	*$25,000*	*$$*	*OVER BUDGET*
2021	*2-50 kW chargers, meter kiosk, 150 kVa transformer*	*ZEVIP*	*75%*	*$$$$$$*	*$25,000*	*$*	*MODESTLY OVER BUDGET*

*this approach will require public RFP to validate budget projections and could be further reduced by self-performing civil work, design, and project management.

Project Delivery models:

Turnkey – this type of project delivery model is the "easiest" in that the customer (in this case the Village) just has to pay and the vendor does everything else. A turnkey package is typically based on a boiler plate design intended to satisfy a broad range of customers.

What is usually included in a turnkey project:

Creating a drawing package, coordinating any required engineering and municipal permit requirements (possible engineering seals and letters of assurance, survey), coordinate power supply with BC Hydro, manage inspections by relevant professionals, oversee construction activities, manage equipment delivery to site, keep track of project budget and schedule. It will include a contingency, profit, and likely be based on the highest municipal standards which may exceed requirements for Lions Bay.

Self-perform – this type of project delivery model could take advantage of skills within the Village to offset some of the project costs.

In the case of this specific project the preliminary drawings do not need a lot more work to be ready for construction. From a civil perspective this is a very simple project, a few concrete pads, some buried conduit, and bollards. Let's capitalize on the work we've done to date.

An electrical drawing package would likely only require a single line diagram, load and line list, panel details and electrical bill of materials. A single drawing capturing these elements in coordination with the vendor supplied information should sufficient for a licenced commercial electrical contractor with oversight by a registered electrical engineer. An experienced licenced electrical contractor can coordinate the power drop and required TSBC electrical permit in coordination with municipal staff oversight and help from an electrical engineer if required.

Public works can tender the project as a supply and install contract based on a set of ready for construction drawings.

A public RFP based on the most basic code compliant scope would provide additional budget numbers to allow council to evaluate the best value. The RPF can be based on the preliminary drawing package, and an understanding the Village will supply a construction drawing set.

I am willing to volunteer to coordinate a ready for construction drawing package complete with professional seals and letters of assurance in coordination with and seeking ultimate

approval from public works and staff. Staff to advise on any liability concerns during this process.

I will volunteer to draft the ZEVIP grant application with support from staff. In consultation with the NRCAN grant review panel I was able to garner valuable feedback to bolster our next application.

I will volunteer to review the RFP to ensure technical alignment with the design intent.

Why do I feel suited to provide this technical input? I have over 20 years of professional engineering experience and I am an active and registered professional engineer in BC.

I have worked through complex permit applications as the registered coordinating professional and professional of record to get hydrogen fuelling infrastructure built in Vancouver, Burnaby, North Vancouver, Saanich, and Kelowna.

I have a working relationship with TSBC, and significant experience working on multidisciplinary engineering projects with far greater technical scope than this very simple project.

The goal here is to get value from the work we've already done, take advantage of the skills we have at our disposal and execute on a project that we've had a mandate to explore since 2019.

We need to get a solid grant application pulled together in the Lions Bay way. Aligning ourselves with a boilerplate vendor package and a turnkey delivery model is a luxury I believe we cannot afford.

Council needs to be forward looking on GHG reductions. The industry is aggressively shifting toward electrification and we have an opportunity to be a purveyor of green power for the foreseeable future.

Follow Up Action:

Issue a public RFP for basic code compliant scope asap. This will ad additional supporting information for the grant application. Time is of the essence now that the June 22nd deadline is fast approaching.

Recognizing the Village would have 24 months to complete the project after grant award, public works could consider tackling the civil works element of the project to prepare it for the electrical contractor with no major schedule pressure. This would be done in a further effort to drive down initial capital. Being awarded a grant does not imply we have to proceed with it if fixed tender costs make it prohibitive.

CAC consider options in parallel during the grant application and review period, explore fundraising options, finding local electrical and civil engineers that may want to contribute to this GHG reduction project.

Lastly, the firehall has 3-phase power. Do we know if there is any spare capacity there? Could we locate the charger closer to the firehall to take advantage of that power?

Communication Plan: TBD

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

Type	**Request for Decision**		
Title	**Electric Vehicle DC Fast Charging Station**		
Author	**Norman Barmeier**	**Reviewed By:**	**Peter DeJong**
Date	**March 14, 2019**	**Version**	
Issued for	**March 19, 2019 Council Meeting**		

Recommendation:

(1) THAT Council approve Staff to investigate best location for Electric Vehicle DC Fast Charging Station for 2 vehicles in terms of access to power and space; and

(2) THAT Council authorize Staff to initiate a connection request with BC hydro and pay the associated design deposit of approximately $500; and

(3) THAT Council budget $5,000 for preliminary charging station design to support the initial BC Hydro connection request; and

(4) THAT Council direct the IC to pursue DC fast charging station "terms of reference" including ownership, maintenance, reliability, and user payment format.

Attachments:

(1) Conceptual Electric Vehicle DC Fast Charging Station drawing.
(2) Electrical Services Information form (BC Hydro)
(3) Service Meter Application form (BC Hydro)
(4) Example DC charger (public interface unit)

Key Information:

In light of the recent provincial Zero Emission Vehicle (ZEV) mandate and an ever-growing presence of electric vehicles in the lower mainland and Lions Bay specifically, the need for charging infrastructure continues to grow. In order to support the ZEV mandate, promote ZEV's in Lions Bay, and show leadership on the topic, Lions Bay should investigate providing DC fast charging infrastructure.

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

With a defined location and an assigned BC Hydro designer the municipality can effectively ascertain the actual project terms of reference and costs associated with pursuing a DC fast charging station power supply.

Following the BC Hydro service request and project initiation, the BC Hydro design representative will provide the municipality with a design and cost estimate to install power to the charging station location. The design deposit for this work is typically around $500.

The preliminary design to support the request for connection could be managed by Public Works with support from an electrical engineer. The level of preliminary engineering support will become apparent upon initial discussions with the assigned BC Hydro designer.

Steps to submitting a commercial service connection request:

BC Hydro Electrical Connection Request, Design, and Energization Process		
1	Request a connection	Pursue these steps now to get a firm cost estimate from BC Hydro with respect to getting power to the location.
2	Project Initiation (deposit required)	
3	Detailed design and cost estimate	
4	Payment & construction planning	Pursue these steps after evaluation of total project cost and merit.
5	Energization	

https://app.bchydro.com/accounts-billing/electrical-connections/multi-residential-commercial-connections.html?WT.ac=ec_ec_multires

With the cost and logistics of providing power to the charging station location in hand the Village can then take the next steps in selecting the charging equipment.

Generally, the provision of power to the charging station location is the biggest unknown. The civil works and distance to the location is the factor that impacts that cost. Starting by defining this cost up front will support establishing a fixed project cost.

Typical project elements and cost:

Project Elements	**Factors impacting cost**	**Typical cost**
Power supply to location	Distance and available power	TBD by initial design work requested here
Transformer and Kiosk	Number of chargers	~ $15,000 per charger
Charger	Model and features	~ $45,000 per charger

Cost Recovery:

While some civic locations in other places are free to users, many charging stations charge fees for use of the facilities, particularly where Fast Charging equipment is employed, to assist with cost recovery of the operational costs from those who benefit from the use. There is some room to charge and there are various POS systems (point of sale), so some investigation needed here. That being said, there is likely little in the way of capital cost recovery potential, so ideally we would find grants and/or fundraise.

Options:

(1) Approve all 4 recommendations to develop a firm project scope and budget.

(2) Approve recommendation 1 and then revisit 2, 3, and 4 after a location has been determined.

(3) Do nothing.

Preferred Option: Option 1 as it is unlikely that no suitable location is available. In order to have enough information to make an informed "go-no go" decision all 4 recommendations need to be answered.

Legal Considerations: Any Municipally provided infrastructure should be located on land owned by the Municipality. The OCP includes an admonition that the Municipality support new forms of low emission vehicular transportation, particularly given the estimation that 92% of Greenhouse Gas (GHG) emissions in Lions Bay is due to transportation related activities.

Financial Considerations: Per the above and additional potential costs in respect of the electrical engineering design work. Provision of charging stations might also be a requirement of any new developments (eg: Centre Rd. Condos and/or PW Yard) or be funded from Community Amenity Contributions (CACs) related to development(s).

Other Considerations:

a. **Official Community Plan:** The OCP includes an admonition that the Municipality support new forms of low emission vehicular transportation, particularly given the estimation that

92% of Greenhouse Gas (GHG) emissions in Lions Bay are due to transportation related activities.

b. **Asset Management Investment Plan:** Life expectancy of ZEV charging stations appears to be 25 years so recognition of ultimate replacement costs ought to be considered.

Follow Up Action: Per Council direction.

Communication Plan: TBA

Electrical Service Information Form

Date: (DD/MM/YY)		Service address (full address and postal code if available)	
Project name			
Legal description			
BC Hydro Reference #			
Anticipated energization date:			

Owner information

Name		Mailing address	
Email address		Address line 2	
Phone/Cell #		GST#	

Technical contact persons	Name	Email address	Phone no.
Electrical contractor			
Electrical consultants			
General contractor			

Building and electrical details

Building state: ☐ New ☐ Existing	Proposed use of building:
Permanent service ☐ Temporary service ☐	
Number of hours of operation per day:	
Number of operational days per week:	
Main switch size: amps 80% rated ☐ 100% rated (BC Hydro approval required) ☐	Code peak demand: kW **Your Designer may inquire further about your computation for the code demand**
Voltage: volts	Average operating demand: kW
Largest motor: hp	Time of day of peak demand: ☐ AM ☐ PM
Fire pump: ☐ No ☐ Yes – Size _____	
Building heated by: ☐ Gas ☐ Electric ☐ Heat pump – Locked Rotor Amp ____ A ☐ Electric furnace ☐ Other	
On-site customer-owned generation: ☐ No ☐ Yes—open transition ☐ Yes—closed transition	
Requested service type: Overhead ☐ Underground ☐	

Load details	Existing (if applicable)	New
Electric heating load	kW	kW
Lighting load	kW	kW
Heat pump including geothermal	kW	kW
Air conditioning motor load	kW	kW
Electric vehicle charging load	kW	kW
Other motor load	kW	kW
Other load	kW	kW
Total connected load	kW	kW
Proposed future load	kW	kW

Metering Information				
Total number of meters	Residential:	Commercial:		
Meter details	Meter type: ☐ 1 Phase ☐ 3 Phase ☐ TBD	Voltage: ☐ 120/240 ☐ 120/208 ☐ 347/600 ☐ TBD Other:		
	Number of wires:	Temporary master metering required ☐ Yes ☐ No		
Current transformer CT type:	☐ Bar CT lugs conductor size: x Conductor to CT lugs: ☐ Cu ☐ Al		☐ Window	☐ TBD

Energization

- Energization of the project will be scheduled upon receipt of:
  - Necessary approvals, permits from appropriate authorities, including municipal, electric inspection and other utilities.
  - Execution of all required documents, including application for service, service agreement(s) and rights-of-way, as required.
  - Completion of metering identification and receipt of electrical room keys.

Electric Service Information Form: Return by email to the BC Hydro office nearest to the service location listed below.

Lower Mainland South	Surrey, Richmond, Delta, Langley, White Rock	**Fv.Design@bchydro.com**
	Abbotsford, Chilliwack, Hope, Mission	**FVE.design@bchydro.com**
Lower Mainland North	Vancouver, Burnaby	**Van-Bby.Design@bchydro.com**
	North Shore Coastal	**design.nsc@bchydro.com**
	Coquitlam, Tri-Cities, Maple Ridge	**design.coq@bchydro.com**
Vancouver Island	Victoria	**Design.svi@bchydro.com**
	Nanaimo	**cvi.design@bchydro.com**
	Duncan and Gulf Islands	**design.dcn@bchydro.com**
	Courtenay, Campbell River, Port Alberni and Qualicum	**Design.nvi@bchydro.com**
South Interior	Thompson/Shuswap – 100 Mile House, Cache Creek, Merritt, Salmon Arm, Valemount, Kamloops	**design.ts@bchydro.com**
	Vernon, Westbank Cranbrook, Fernie, Invermere, Nakusp	**design.ok@bchydro.com**
North Interior	Prince Rupert, Terrace, Smithers, Vanderhoof, Prince George, Quesnel, William Lake, Fort St John, Dawson Creek	**design.nr@bchydro.com**

Please note: incomplete information can lead to both project delays and added costs.

BC Hydro
Power smart

Application for a BC Hydro Account

This application for service is to set up your electricity consumption billing for a **temporary construction meter, temporary master meter and permanent meter account.** An application for each of these meter types will be required. To avoid any delays to your meter installation or electrical service connection, please complete and submit this form to your BC Hydro Distribution Designer.

For new customers or companies: this form will only be accepted if submitted by someone with signature authority for this account. You are considered the business owner (president, principal or partner) or currently have account authorization for another BC Hydro account for this business.

This application is for a:

☐ Temporary construction meter ☐ Temporary master meter ☐ Permanent meter account

Business information

If during the construction phase a different company name is required for the electrical service, it's the customer's responsibility to notify BC Hydro of any name changes. BC Hydro will not be responsible for corrections after bills are issued.

Business or company name: _____

British Columbia Business ID (Registration Number): _____

Business type (e.g. Developer, Property manager): _____

Has the same business name ever been used to apply for BC Hydro service? ☐ Yes ☐ No

Will this business or company name be used until the project is completed? If no, provide the business or company name that will be used for billing purposes. The business or company name cannot be changed once we've set–up the BC Hydro accounts.

☐ Yes ☐ No

Company Name: _____

Business owner

President, principal or partner name: _____

Phone number: _____

Other principals or partners: _____

Account authorization information

Your name: _____

Your position: _____

Your email address: _____

Your phone number: _____

Your cell phone number: _____

Do you have signature authority for this account? ☐ Yes ☐ No

Are there any other authorized contacts? **BC Hydro can only speak with authorized contacts listed on the account. If not listed on application, BC Hydro will not be able to discuss the account.**

By providing account authorization, the named authorized contacts will be able to manage any account registered to your business. This includes accessing billing information and making changes to the account, including canceling or applying for service to stop or start billing for accounts registered to your business.

☐ Yes ☐ No

List of authorized contacts: _____

_____

BC Hydro
Power smart

Service location/Civic address

If there are changes to the Service location/Civic address during the project, it is the customer's responsibility to inform BC Hydro. BC Hydro will not be responsible for correction after bills are issued.

Service location(s)/Civic address(s) (list all addresses for project):

_____

_____

City: _____

Postal Code: _____

Billing address

Is the billing address the same as the service location? If no, please provide the billing address. ☐ Yes ☐ No

Mailing address: _____

City: _____

Province: _____

Postal Code: _____

Consolidated billing

Customers with multiple BC Hydro accounts may choose a consolidated bill. Consolidated bills arrive as a single bill inclusive of all individual accounts billed that month.

Would you like to set up consolidated billing? ☐ Yes ☐ No

If you have an existing consolidated bill, please provide the Consolidated Account number: _____

Declaration for electricity service

By submitting this application, I am confirming I have signature authority for this account or have previously been granted account authorization by someone with signature authority and request BC Hydro to establish electricity service at the service location stated above. I understand that I will be responsible for paying for the electricity used at the service location. Please see terms and conditions below.

Signature: _____ Date (yyyy/mm/dd): _____

Print Name: _____

TERMS AND CONDITIONS

Except as otherwise provided in the Service Agreement, a Person becomes a Customer and Service commences when:

1. BC Hydro connects or re-connects the Premises to BC Hydro's electrical system; or
2. The Person's right to possession of the Premises commences, whichever is later and regardless of whether such Person has completed and signed an application or any contract for Service, and Service will continue until Terminated by BC Hydro or the Customer.

PRIVACY

The business personal information (e.g. your name and your business email address, contact telephone number, details that may otherwise be on your business card) collected on this form is required for the purposes of establish and servicing an electrical connection. BC Hydro collects this business personal information solely for the purpose of enabling you, should you so choose, to access and use this form to establish a new electrical connection.

BC Hydro serves customers in accordance with the Electric Tariff regulated by the British Columbia Utilities Commission (BCUC), and in compliance with the Hydro and Power Authority Act. If you have questions about the collection of your personal information as described in this notice, please contact us at **1 800 BCHYDRO (1 800 224 9376)**.

BC Hydro
Power smart

Express 250

Specifications and Ordering Information

Ordering Information

The order codes below represent specific product configurations. Other product options are available. Please contact ChargePoint Sales for information and order codes.

Hardware

Description		Order Code
Model	Express 250 Station (50 kW) includes 2x Power Modules, 1x CCS1 cable, 1x CHAdeMO cable (NA)	CPE250C-CCS1-CHD
	Express 250 Station (50 kW) includes 2x Power Modules, 1x CCS2 cable, 1x CHAdeMO cable (NA)	CPE250C-CCS2-CHD
Option	Other cable combinations are available using CCS1, CCS2 and CHAdeMO connectors.	Please contact ChargePoint sales

Cloud Plans and Software

Description	Order Code
ChargePoint Cloud Plan	Please contact ChargePoint sales
ChargePoint Assure — Prepaid Assure Plan for one Power Module. Express 250 requires 2x EXPRESS-ASSURE*n* to cover the two Power Modules and the CPE250 station.	EXPRESS-ASSURE*n*[1]
ChargePoint Assure — Assure Plan for one Power Module and invoiced annually. Express 250 requires 2x EXPRESS-ASSURE*n* to cover the two Power Modules and the CPE250 station	EXPRESS-ASSURE*n*-COMMIT[1]
Software upgrade token for Express 250 to increase max power from 50 kW to 62.5 kW	CPE250C-625-UPGRADE
Station Activation and Configuration	CPSUPPORT-ACTIVE

All CPE250 stations require a cloud plan.

[1] Substitute desired years of service (1, 2, 3, 4, or 5 years) for *n*

Order Code Examples

If ordering this…	…the order code is
Express 250 Station (50 kW) includes 2x Power Modules, 1x CCS1 cable, 1x CHAdeMO cable (NA)	CPE250C-CCS1-CHD
3 years of prepaid Assure coverage upon successful site validation. Assure covers Power Modules & station. Express 250 requires 2x EXPRESS-ASSURE3 for its 2 Power Modules.	2 x EXPRESS-ASSURE3
Station Activation and Configuration	CPSUPPORT-ACTIVE

Express 250 Specifications

Station Electrical Input

Input Rating	400V AC, 3-phase, 100A, 50 Hz 480V AC, 3-phase, 80A, 60 Hz
Wiring	L1, L2, L3, Neutral & Earth

Station Electrical Output

Max Output Power	62.5 kW*
Output Voltage, Charging	200–1,000V DC
Max Output Current	156A
Max Modules per Station	2

* Default is 50kW, upgrade token is required to access 62.5kW

Paired Station Electrical Output

Paired Max Output Power	125 kW
Paired Max Output Current	CCS1: 174A, CCS2: 200A, CHAdeMO US: 140A EU: 125A

Power Module

Max Output Power per Module	31.25 kW
Max Output Current per Module	78A

Station Functional Interfaces

Max Connector Types per Station	Up to two different connector types per station
Supported Connector Types	CHAdeMO, CCS1 (SAE J1772™ Combo), CCS2 (IEC 61851-23)
Cable Length with Swing Arm	Full Horizontal Reach: 4.27m (168”)*
Driver Interaction Display	Full-color 254 mm (10 in) LCD display for driver interaction
Top Display	Full-color 508 mm (20 in) LED display for notifications
Authentication	RFID: ISO 15693, ISO 14443, NEMA EVSE 1.2-2015 (U_R) Tap to Charge (NFC on Apple & Android) Plug and Charge: IEC 15118-1 Remote: Mobile and in vehicle (if supported by vehicle)

* Horizontal reach to typical vehicle charging port: 3.76m (148”)

Connectivity Features

Local Area Network	2.4 GHz and 5 GHz WiFi (802.11 b/g/n)
Wide Area Network	4G LTE (fall back to 3G GSM)
Supported Communication Protocols	OCPP
Service and Maintenance	Remote system monitoring, diagnostic, and proactive maintenance

Energy Management Features

Dynamic Power Management	Allows a fixed maximum power output per station or lets the system dynamically manage the power distribution per station
Remote Energy Management	Manage output power via the ChargePoint Admin Portal, API, and Open ADR 2.0b VEN

Safety and Operational Ratings

Vehicle Safety Communication	CHAdeMO – JEVS G104 over CAN, CCS1 – SAE J1772 over PLC and CCS2 — IEC 61851-23
Plug-out Detection	Power terminated per JEVS G104 (CHAdeMO), SAE J2931 (CCS1) and IEC 61851-23 (CCS2)
Station Enclosure Rating	Type 3R, IP44
Safety Compliance	UL listed: complies with UL 2202, UL 2231-1, UL 2231-2 CE marking: complies with IEC 62196, IEC 61851
Station Surge Protection	Tested to IEC 6100-4-5, Level 5 (6 kV @ 3,000A). In geographic areas subject to frequent thunder storms, supplemental surge protection at the service panel is recommended.
EMC Compliance	U.S.: FCC part 15 Class A; EU: EN55011, EN55022 and IEC61000-4
Power Module Conversion Efficiency	Up to 96%
Power Factor	0.99 at full load
Harmonics	iTHD < 5% (Complies with IEEE 519 Requirements)
Power Module Cooling	Liquid Cooling Technology
Operational Altitude	<3,000 m (<9,800 ft)
Operating Temperature	-30°C to 50°C (-22°F to 122°F)
Storage Temperature	-40°C to 50°C (-40°F to 122°F)
Operating Humidity	Up to 95% @ 50°C (122°F) non-condensing

Generic Specifications

Station Dimensions	2,230 mm x 712 mm x 420 mm (7'4" x 2'4" x 1'4")
Station Weight (without Modules)	250 kg (551 lb)
Power Module Dimensions	760 mm x 430 mm x 130 mm (2'6" x 1'5" x 5")
Power Module Weight	45 kg (98.5 lb)

ChargePoint, Inc. reserves the right to alter product offerings and specifications at any time without notice, and is not responsible for typographical or graphical errors that may appear in this document

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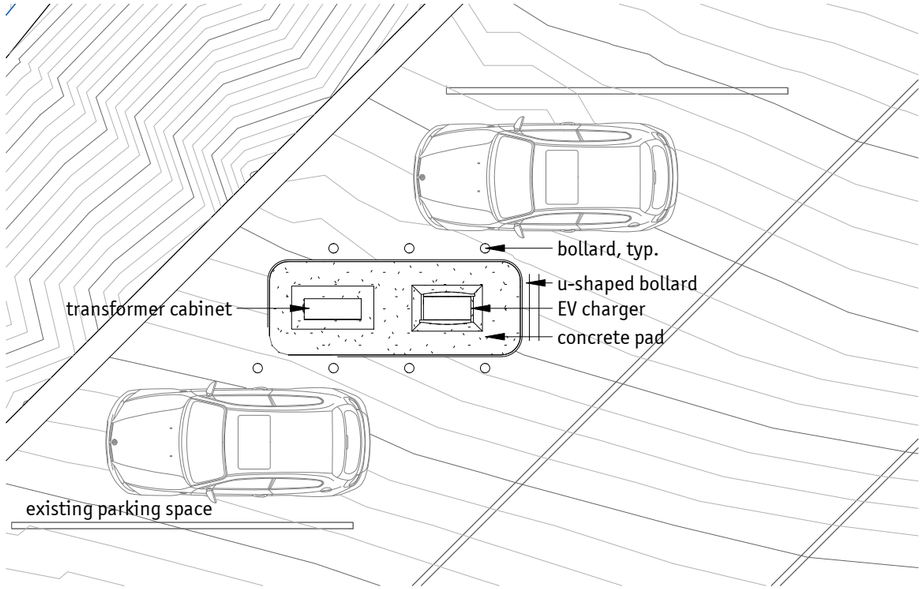
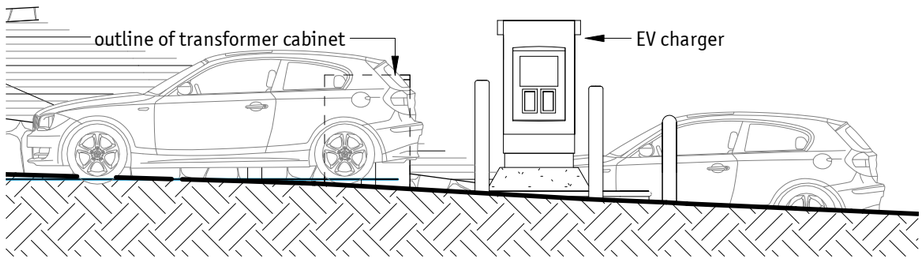
chargepoint.com



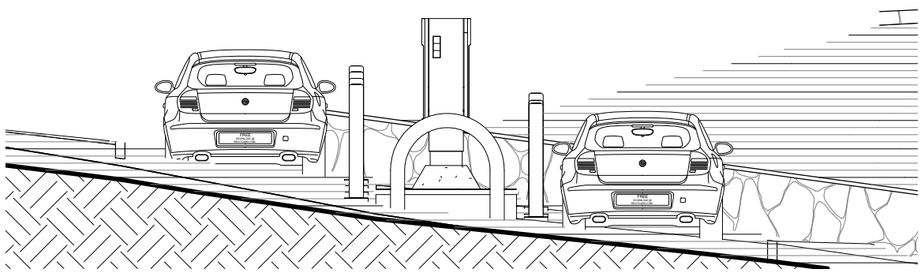
1 / A1 **plan**

scale - 1/8" = 1'-0"



2 / A1 **section 1**

scale - 3/16" = 1'-0"



3 / A1 **section 2**

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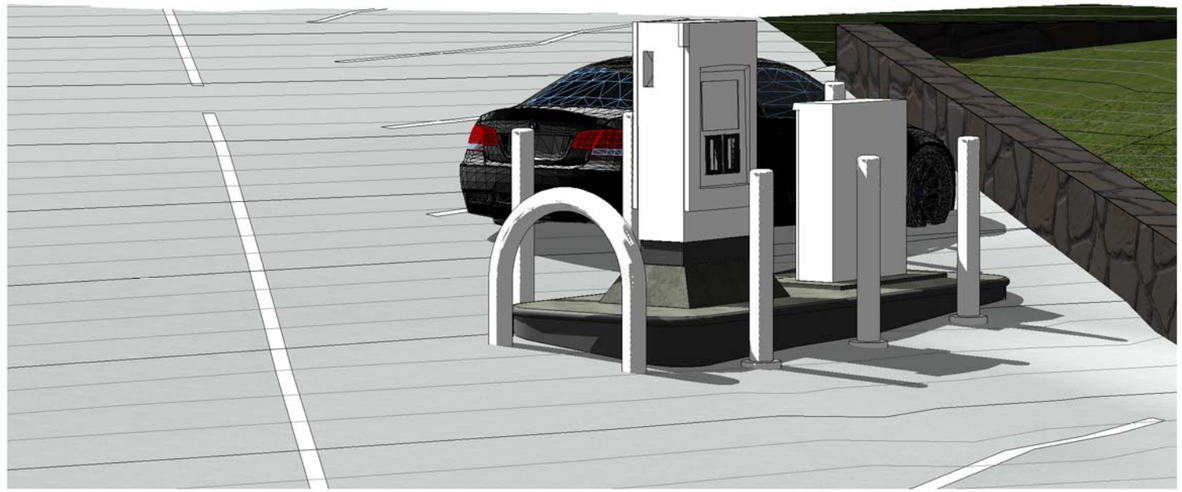
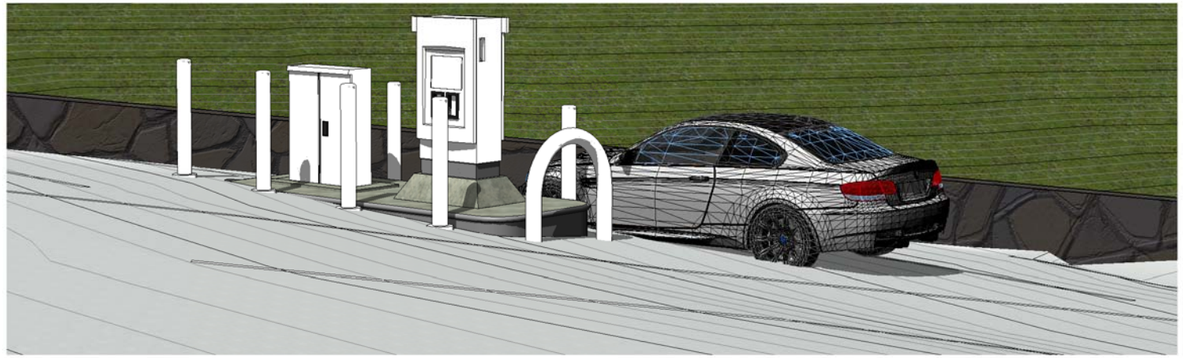
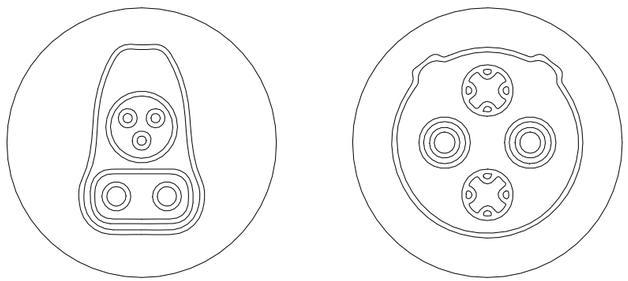


4 / A1 **3d view 1**



5 / A1 **3d view 2**



6 / A1 **ev connector types**

Fast Charging Station Specifications - proposed

vehicles served	2 at the same time
station output	up to 62.5 kW
battery voltage supported	200 to 1000 Volts
connectors supported	CHAdeMO, and SAE J1772 Combo

7 / A1 **station specifications**

PLACE

Lions Bay DC Fast Charging Station

4010 Crosscreek Rd
Lions Bay, British Columbia

Issue:
design

Project:
1907

drawn:
amL

checked:
hj

heather l johnston architect aibc

PLACE architect ltd.
6262 st georges avenue
west vancouver bc

778 279 7274 studio
778 386 6769 cell

heather@placearchitects.com

A1

03/13/19


STOP

May 3, 2019

Village Update

Your Weekly News & Updates

Updates from Mayor and Council

From the desk of Councillor Barmeier

Back to the Future in Lions Bay – Supporting the Adoption of ZEVs in BC

With gas prices soaring and the need for environmental protection on everyone's mind, alternative fuel vehicles are gaining in popularity. In fact, by 2025 10% of all cars sold in BC will have to be ZEV, 30% by 2030, and 100% by 2040. Currently you will find almost every auto manufacturer has ZEV models on offer.

The Lions Bay Official Community Plan outlines our goals in policy and action for the protection of air quality and noise levels.

Electric vehicles do both of these things; zero emissions and near silent operation.

On March 19th, 2019 council carried my motion to investigate DC Fast charging in Lions Bay and allocated up to $5,500 for this first step. We want to take direct action to provide ZEV fueling infrastructure for Lions Bay residents as well as passers-by. Wouldn't it be nice to have cleaner air to breathe and reduce the amount of noisy petrol vehicles passing through? It's a win-win for everyone.

What is a ZEV?

Specifically, ZEV stands for zero emission vehicle. Examples of these are BEV (battery electric vehicle) and FCEV (fuel cell electric vehicle). Currently the majority of ZEVs on offer are battery electric.

What is DC fast charging?

DC fast charging is a quick way to charge the battery in your electric car. BEVs can be charged in 3 different ways. The industry jargon refers to level 1, level 2, and level 3 charging. Where level 1 is a conventional 120V AC plug found around your house. Level 2 is similar in power supply to a stove's 208-240V AC, 30-40 amp circuit. Level 2 chargers are generally installed in your garage or driveway by an electrician. Level 3 is a high voltage direct current (DC) charging station.

Level 3 chargers, or DC fast chargers, are generally reserved for municipal, institutional, or commercial settings.

Table 1. Typical charging times for various chargers.

Charging level	Charging voltage	Typical installation	Charger output	Range gained in 30 minutes	Charge time for 100km range
Level 1	120 V AC	Ordinary household plug	7 kW	~25 km	~4 hours
Level 2	208-240 V AC	Home based charger	22 kW	~75 km	~80 minutes
Level 3 – DC fast charging	600-1000 V DC	Municipal or institutional	150 kW	~300 km	~20 minutes

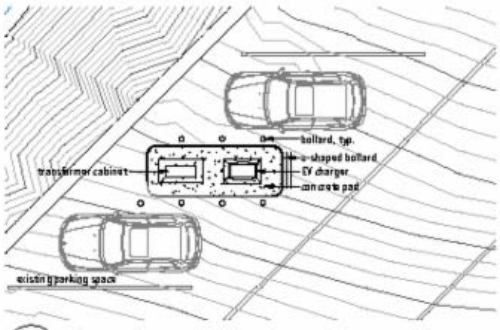
How much does it cost to drive 100 km in an average petrol vehicle versus an average electric vehicle?

Energy source	Cost per unit	Total required to travel 100 km	Cost per 100 km
Petrol	$1.70 per L	10 L	$17.00
Electricity	$0.0945 per kWh	18 kWh	$1.70

*the numbers here are average best estimates only.

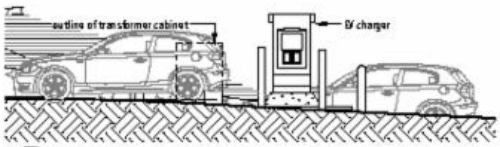
What does a DC fast charging station look like?

We had a local architect develop a concept sketch for us. They believe in this initiative so they did the work for free.



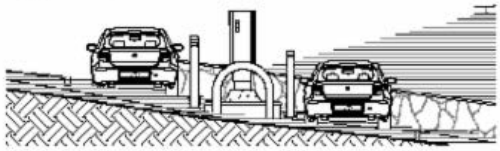
1 A1 plan
scale - 1/8" = 1'-0"

4 A1 3d view 1



2 A1 section 1
scale - 3/16" = 1'-0"

5 A1 3d view 2



3 A1 section 2
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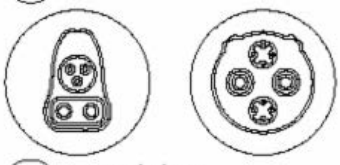

6 A1 ev connector types

vehicles served	2 at the same time
station output	up to 62.5 kW
battery voltage supported	200 to 1000 Volts
connectors supported	CHAdeMO, and SAE J1772 Combo

7 A1 station specifications

What would a DC fast charging station cost and how would we pay for it?

While costs may vary due to a few factors, typical costs for a DC fast charging station are about $80,000. The federal government, through the Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative is paying anywhere from 75-100% of the cost of eligible stations in the form of a grant. Of course, we need to apply and just like our infrastructure grants we are not guaranteed to win, but at least we've agreed to try.

We welcome your thoughts and feedback on this initiative. Click here or email feedback@lionsbay.ca or drop off your comments at the Village Office or through their afterhours mail slot. Your feedback will be reported back to Council next month.

With kind regards and an eye on the future,
Your councillor and engineer at heart, Norman Barmeier, P.Eng.

For more information on the Province's zero emission mandate click here.

To find out about current ZEV incentive programs click here.

Updates from the Municipality

Being so close to thriving natural ecosystems, Lions Bay shares its urban environment with wildlife big and small – and that means that we need to be mindful of potential conflicts between humans and wildlife.

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

Type	**Information Report**		
Title	**DC Fast Charging Station – Resident Feedback**		
Author	**Shawna Gilroy**	**Reviewed By:**	**Peter DeJong**
Date	**May 9, 2019**	**Version**	
Issued for	**May 14, 2019**		

Recommendation:
THAT the Information Report, "DC Fast Charging Station – Resident Feedback" be received.

Attachments:
(1) DC Fast Charging Station – Resident Feedback
An additional letter was submitted by former mayor, Karl Buhr, which is attached as Correspondence to the Agenda.

Key Information:
Councillor Barmeier submitted an article in the May 3rd Village Update on DC Fast Charging Stations and the reasons why having a station installed somewhere in the Village would be beneficial.

He explained that the cost to install and maintain a charging station varies due to a few factors, but typical costs are about $80,000. The federal government, through the Electric Vehicle and Alternative Fuel Infrastructure Development Initiative is paying anywhere from 75-100% of the cost of eligible stations in the form of a grant. Lions Bay would need to apply, however are not guaranteed to win.

Feedback from residents regarding this initiative was requested; much feedback was in favour of applying for the grant to support the charging station – several of whom stated owning an electric vehicle already, however others felt that it was not of sufficient benefit, especially if the grant was unsuccessful.

Follow Up Action:
None anticipated at this time.
Communication Plan:
None at this time.

Full Name	Email Address	Your Feedback
[redacted]	[redacted]	Yes!!!! We absolutely should have a fast charging station. I have an electric car with a level 2 station in my driveway. I love it and think we, as a community, should support the EV technology. I also think that we should encourage the Lions Bay store to sell green products. Recycled content toilet paper, organic low packing food etc. It's easy to understand that we should all do our part when living in this amazing beauty.
[redacted]	[redacted]	Reading of the plans to install a charging station for the village and I fully support this. I would suggest that for our needs the level 3 is the way to go. For most residents they will have a level 2 at home and re-energizing their vehicles is done at home overnight. But there may be odd occasions a resident would need a quick charge that the level 3 would provide. Passers by would only really have benefit of a fast charger (level 3) Rather than the closer level 2. I use level 2 when I am parked for several hours but otherwise is not of value. When I park for short periods say a 1/2 hour and there is a Level 3 charger this is very valuable. I have used these at places downtown, Horseshoe Bay, the airport etc. Great Plan!
[redacted]	[redacted]	As a leaf owner I think this is fantastic. The horseshoe bay charger although close services lots of people coming from the island or Sunshine Coast. Ours will probably service people passing through. Most ev owners have level 2 at home so I don't foresee this helping people more than top up who live in lions bay. But all the same it will help the whole network and extend someone's range somewhere.
[redacted]	[redacted]	Very supportive of installing EV charging stations in Lions Bay. Thanks!
[redacted]	[redacted]	Thank you very much for the initiative. My wife Vivienne Gallegos and me think it is an excellent plan. We own an electric vehicle, an eGolf, and have installed a level 2 charger in the garage. However, having a level 3 charger in the village would be a great advantage. Kudos to you, councillor!
[redacted]	[redacted]	Love the EV station idea, let's go for it!!

[redacted]	[redacted]	Thank you for asking for feedback. We appreciate all the work you do. I believe in EV's wholeheartedly. Any EV fast charging infrastructure costs as well as operational costs cannot be born by Lions Bay taxpayers. 100% of the capital costs must be paid with grants and 100%+ of the operational costs must be paid by the users. All costs associated with this initiative including the $5,500 "first step" costs and ongoing and incidental costs including signage, media, maintenance and reserves for replacements must be covered, and not by Lions Bay taxpayers. Thank you, Ben Gauer 22 Brunswick Beach Rd.
[redacted]	[redacted]	Many thanks for your excellent and informative article. I have an electric car and can charge it at home but a quick charger would allow me to top it up if I get too low and need to make an unexpected trip. Electric cars from the city heading to Whistler and beyond could extend their range and perhaps make purchases from our store. Thanks again, Frank.
[redacted]	[redacted]	Re: Supporting the Adoption of ZEVs in BC comments by Norman Barmeier - well researched, accurate and appreciated We recommend LB application to the Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative Given LB location are would likely receive 100% funding
[redacted]	[redacted]	This is a welcome idea, particularly since the government is willing to pay so much of the cost. Also it is a long way between stations here on the Sea to Sky. I am very happy to say that I purchased an electric vehicle yesterday and happy to know that I won't be polluting our beautiful area on the long commute to Vancouver. As gas prices have risen so much there will be more and more people buying electric vehicles - thus more need for charging stations. On the day the federal government announced another grant for $5,000.00, in addition to the provincial grant, there were 70 orders for the cheaper model Tesla.
[redacted]	[redacted]	I think it is a great idea. I am all fore lions Bay being a leader in clean air. Our next car will definitely be electric.
[redacted]	[redacted]	The idea is good if we can receive100% funding. Any costs to the village should have been budgeted for or will take away from other expenses. Would we charge for the cost of hydro or increase our budget to pay for it? Where are we thinking of putting the station, on private property, at the works yard or at Municipal Hall? The occupants of the vehicle would be waiting around for half an hour or more. We have limited parking spaces available and I personally think the charging station should be on village land or it might cause problems in the future.
[redacted]	[redacted]	Yes i like to have EV charger in Lions Bay.

[redacted]	[redacted]	Regarding the EV charging station I do not feel the village can afford this. We have seen large tax increases to maintain our existing infrastructure. The drawings provided show a very large footprint. Where will this station be installed?
[redacted]	[redacted]	I am against this initiative for two reasons: 1) Lion's Bay residents owning EV or purchasing EV vehicles will have charging capabilities at their homes. Surely no one is buying an EV without charging capability at their residence. 2) Lion's Bay is under siege from tourists and passers-by getting off the highway to look around. We do not need to encourage any additional "passers-by" from entering our community. We have enough already, and barely if at all the proper infrastructure to support even more. Yes, i am all for green initiatives and "sound/noise" management. It would seem that the energy/resources may be well spent working on initiatives to cull/eliminate or simply reduce the ever increasing "noise" associated with commercial truck "engine braking". Squamish port owned by Western Stevedoring has significantly increased their dock operations resulting in an increase in truck traffic up and down the sound. Many of these trucks employ "engine braking" technology that can be extremely noisy. Signage on the highway seems only somewhat effective. More can be done. I would guess many in the village are effected. This needs to be a priority in my humble opinion.
[redacted]		1st point - Who is going to pay for this? I don't want my taxes wasted on this project that has no benefit to people who do not own an electric vehicles. 2nd point - electric cars are not zero emmission, the camicals from the production or disposal of batteries poison our enviroment. 3rd point - the bulk of the cost of driving an electrical vehicle is paid upfront when you buy it.
[redacted]	[redacted]	Re charging station. This would not affect residents in Lions bay as we would all charge at home. I think large shopping malls etc are where these should be placed. the average passer by does not stay for hours to boost our commercial revenue as we have so little, our money can be better spent elsewhere

[redacted]	[redacted]	I say GO GO GO! I own a Chevy Bolt and I can't say enough about what a smart move it is to own an electric vehicle. Climate Change. We need to do everything we can and installing a fast charger in the village not only makes great sense, it's a necessity! Quieter, cleaner through traffic as well as a quick top up for villagers who forget to charge their car, (we've all forgotten to charge our mobile phones occasionally) and when we can't get up the mountain in those snow storms, it's a good back up when we can't make it up to our home charger. These are exciting times, thank you for taking the initiative, let's do this!
[redacted]	[redacted]	I believe Lions Bay would have a higher than average per capita adoption of ZEVs than most communities. We have 2 and there is almost 1 per house on Lions Bay Ave. Where are you proposing to put the charging station and who will monitor its use so homeowners are not shifting costs of charging to the village?
[redacted]	[redacted]	YES please to DC fast charging station!!!!!! I had to go twice to the one in horseshoe bay yesterday and they are becoming more and more popular. While I was there both times two people came up to me to ask me about buying an electric car. My EV is 3 years old so it only has 100 km range, but we have never looked back - it drives better then my Range Rover and as soon as there's an affordable SUV, we'll happily get rid of fuel. The time is now more than ever to do this, with politics what they are and the planet being at its absolute worst we need to change fast for future generations. Perhaps Lions Bay can think of more ways to use renewable energy...turbines in our rivers, solar for our direct sunny summer afternoons/evenings??
[redacted]	[redacted]	I have been involved with this for some time. (sound very noble.) This reminds me on the days when paper bags became a NO NO and the word was go to plastic. What is overlooked is; that the Lithium for the Battery in EV is extracted using fossil Fuel. The real Future Car will NOT be powered by a lithium fuel cell battery. It will be powered by a hydrogen fuel cell . Japan is actively perusing and initiating that option. Hope this to be of some help.

		Speeding on Sea to Sky – Mayor McLaughlin following up with Squamish Mayor & RCMP.	ongoing
127	May 5, 2020	Options for Electronic Building Submissions	CAO DeJong – nothing to report
133	June 2, 2020	G2: Mayor Rob, City of Port Moody, requesting support for homelessness solutions and advocacy	Mayor Mclaughlin to reply
134	June 2, 2020	R1: D. Miller re: parking	Mayor McLaughlin to reply
135	June 2, 2020	R1: Brigitta Shore re parking	Mayor McLaughlin to reply

8. Reports

A. Staff

i. CFO: Update on EV grant application (Page 21)

Staff Recommendation:

THAT Council authorize the Chief Financial Officer to sign the Proof of Funding letter for the Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative confirming that the Village of Lions Bay will contribute the amount of $50,000 towards the Lions Bay Fast EV Charger project.

ii. Tides Canada changes its name to MakeWay (Page 33)

Staff Recommendation:

THAT the Information Report, "Tides Canada changes its name to MakeWay" be received.

iii. CAO: Filming Application for Lions Bay Beach Park (Page 39)

Staff Recommendation:

(1) THAT the film permit application for "Kite Festival of Love" be approved, subject to the following conditions:

(a) Park Closure – Council implements a temporary policy to not enforce the existing park closure order against the applicant for the dates of June 25, 26, 29 & 30, 2020.

(b) Parking – parking in the Lions Bay Beach Parking lot to be limited to approximately 4 work trucks including a generator, to be stationed as far away from the residences above as possible (additional generator to be stationed as close to the Beach Park as possible with efforts to be made to muffle the noise from both generators) with no trucks or equipment blocking the CN control

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

Type	**Information Report**		
Title	**Lions Bay ZEV initiative – fast charger revenue projections**		
Author	**Norman Barmeier**	**Reviewed By:**	
Date	**September 16, 2020**	**Version**	**0**
Issued for	**September 22, 2020**		

Recommendation:

THAT the Information Report, "Lions Bay ZEV initiative – fast charger revenue projections" be received.

Attachments:

(1) Revenue Projection Worksheet
(2) City of Vancouver – Parking Meter By-Law No. 2952
(3) Administrative Report – User Fees for City Owned and Operated Public Electric Vehicle Charging Stations.
(4) May 3, 2019 Village Update

Key Information:

The proposed fast EV charger project promises to provide a continuous and reliable stream of revenue for the Village.
Council approved the investigation of fast EV charging infrastructure in the spring of 2019. A preliminary plan was designed and used to support an EVIFIDI grant application which was submitted in July 2020.
The grants if won may offset as much as 75% (up to a maximum of $75,000) of the capital cost of the fast EV charging station. The grant can also be used to cover an extended service and maintenance plan.
With widely adopted service fees in the lower mainland for fast EV chargers, the Village has the potential to generate annual revenue for the life of the fast EV charger.
The current going rate for fast EV chargers in the lower mainland is $0.27 per minute of use, or $16 per hour.

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The City of Vancouver published usage data for their EV infrastructure in 2017 an average usage of 4.5 hours per day, with more popular locations seeing usage over 12 hours per day. EV adoption and usage have and will continue to increase as more drivers switch to electric vehicles. As a result of increased usage, increased fast EV charger meter revenue will be realized over time.

Table below summarizes potential annual net revenue from one metered fast EV charger:

Utilization	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
2hr/day	$8,238	$8,485	$8,740	$9,002	$9,272	$9,551	$9,837	$10,132	$10,436	$10,749	$94,448
4hr/day	$17,626	$18,154	$18,699	$19,260	$19,838	$20,433	$21,046	$21,677	$22,328	$22,997	$202,062
8hr/day	$23,884	$24,600	$25,338	$26,098	$26,881	$27,688	$28,518	$29,374	$30,225	$31,163	$273,804
12hr/day	$33,271	$34,269	$35,297	$36,356	$37,447	$38,570	$39,727	$40,919	$42,147	$43,411	$381,418

While these numbers are projections only, they demonstrate the potential for reliable and increasing revenue over time.

The proposed fast EV charger infrastructure project allows for expansion of up to 4 fast EV chargers at an incremental cost. For each additional charger an additional revenue stream may be realized.

Follow Up Action: Staff to confirm BC Hydro billing model, demand charges, and any potential EV charger incentives or discounts available. CAC to do further research on current demand and use scenarios.

Communication Plan: Once we receive notice from the EVIFIDI grant award, win or lose, I'd like to write a Village Update article summarizing the effort to date.

- Compliance with civil standards
- Whether sidewalks are part of the design
- Concerns regarding Village's budget commitment
- Numerous contractors may be involved for different aspects of the project
- Taking away from other projects
- Local contractors can benefit from extra work
- Good legacy for 50th Anniversary

Moved/Seconded

(1) THAT Council supports the Lions Bay Avenue Connector Project;
(2) THAT the Village of Lions Bay will be responsible for managing the project to completion by December 31, 2021 and in accordance with the design guidelines provided by TransLink;
(3) THAT the Village of Lions Bay will be responsible for the financial management of the project, including contribution of its share of 25% of the costs up to $68,667 and any cost overruns or ineligible expenses;
(4) THAT staff take any additional steps required to secure the grant funding for the Lions Bay Avenue Connector Project, including bringing forward for Council consideration an agreement with TransLink in respect of the project.

CARRIED

OPPOSED: COUNCILLORS ABBOTT AND BAIN

B. Mayor

i. <u>Village Update Statistics – verbal update</u>

Mayor McLaughlin provided statistics on the Village Update readability, noting:

- 832 people receive the VU, 68% open rate, 14% click rate (78 clicks)
- popular subjects that people click on are garbage collection schedules, Mayor's Message, Metro Vancouver's Wood Burning Bylaw, community events
- overview of subjects in letters to Council

C. Council

i. <u>Councillor Barmeier – Electric Vehicle DC Fast Charging Station</u>

Discussion ensued on:

- Clarification of location of DC charger to North side of municipal hall

Councillor Barmeier presented on the DC Fast Charging station, noting:

- Background and history of grant submissions
- Background of grant programs

- Current trends
- Overview of current program, ZEVIP
- Benefits of location of Charging Station
- 75% grant

Discussion ensued on:
- Revised architectural set to confirm exact location
- Charger will charge one vehicle at a time
- Size of transformer
- Hidden items
- Concerns of parking at the hall when activities in place
- Increase of use of electric vehicles in Village

Moved/Seconded

1) THAT Council approve locating a single DC charger at the North side of municipal hall along Crosscreek Road instead of the steeper area at the intersection of Crosscreek and Oceanview; and
2) THAT Council authorize additional revisions to the Architectural set to reflect the alternate location at municipal hall; and
3) THAT Council authorize staff to re-submit a revised version of the grant application under the February 2021 intake for ZEVIP; and
4) THAT Council approve appropriate signage directing traffic toward charger from north and southbound Sea-to-Sky highway be reflected in the grant application.

CARRIED

D. Committees

i. Curly Stewart Memorial Trust Fund Committee Terms of Reference

Councillor Abbott presented the report on the Curly Stewart Memorial Trust Fund Committee Terms of Reference.

Moved/Seconded

(1) THAT the Terms of Reference for the Curly Stewart Memorial Trust Fund Committee, as amended, be approved; and

(2) THAT Council direct staff to publish a call for Expressions of Interest for persons to sit on the Curly Stewart Memorial Trust Fund Committee in the Village Update.

CARRIED

VILLAGE OF LIONS BAY

2021 COUNCIL PRIORITIES				
ITEM	**DESCRIPTION**	**COMMENTS**	**TARGET DATE**	
			Quarter	**Year**
Lions Bay Beach Park Improvements	Re-submitted grant application for $785K and awaiting approval before spending can begin	If unsuccessful, we have allocated $285K to be priortized for washrooms, playscape and kayak rack	Q3	2021
Highway Noise	Work with MoTI to improve (lessen) highway noise	Reviewing Highway Concessionaires Agreement re. maintenance of "Quiet Pavement"	Q1	2021
Policies Required to Advance the Careful Development of Lands within the Village	Policies required include: Development Permit Areas for development of lands subject to Natural Hazards; Community Amenity Contributions; Subdivision Servicing; Development Cost Charges	Review of DPAs and CACs planned for first half of year.	Q1-Q2	2021
Climate Action Committee Initiatives	Adopt Terms of Reference for the Committee and select committee members; support CAC initiatives and work with My Sea to Sky to support development of Climate Action Report Card Tool	Work with Ctte re. background documents and review of actions to date re. s.9, OCP. Continue to work with EV providers for quote and ZEVIP grant support.	Q1-Q2	2021
50th Anniversary Celebration	Adopt Terms of Reference for the Committee and select committee members; support Celebration initiatives	Determine budget for inclusion in VoLB 2021 Budget. Liaise with MoTI re. mural request.	Q1-Q2	2021
Infrastructure Master Plan (IMP)	Support advancement of prioritized projects in the IMP	Ongoing: Completed WWTP; Final stages of 3-PRV project; Ph.4/5 Tank watermains to be done Q2. Infrastructure Planning Grant (IPG) submitted January 2021 - tender Q2. Paving, bridge repairs & resevoir inspections Q3.	Q1-Q4	2021

ii) Council Priorities – Quarterly Update

CAO DeJong presented the Council Priorities – Quarterly Update, noting:

- Grant update for the EV Charger
- Current discussions with the 50th Anniversary Committee

Staff Responded to questions noting:

- Amend the Highway Noise item to Q2
- 50th anniversary budget already established, embedded within master budget at $20,000
- Asset management grant: has been submitted and is oversubscribed; estimate of nine months for decision
- Will provide notice to residents in the Village Update that they cannot burn woodstoves beginning May 15th

Mayor McLaughlin noted that he will contact Metro Vancouver staff to request information and presentation on the Metro 2050 policy review.

Moved/Seconded
THAT the "Council Priorities – Quarterly Update" report be received.

CARRIED

iii) Increasing Public Engagement and Communications

The Municipal Coordinator presented the report on Increasing Public Engagement and Communications.

CFO Rooke confirmed that it is budgeted item.

Discussion ensued on:
- getting survey results first
- cost of platform
- concerns around staff time to implement
- concerns around having residents sign up to the platform
- focus on improving the Village website
- concerns around moderation of comments
- moving slow
- benefits of profiling projects

The Municipal Coordinator noted that staff currently have the capacity, as project communication should be the norm, that the current contact list can be migrated for the purpose of newsletter distribution only, and that staff are involved with moderation of comments.

Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative

Through the Electric Vehicle and Alternative Fuel Infrastructure Initiative, the Government of Canada is investing $96.4M to support the establishment of a coast-to-coast charging network for electric vehicles, natural gas stations along key freight corridors and stations for hydrogen fuel cell electric vehicles in metropolitan centres, $76.1M to support the demonstration of next-generation charging technologies as well as $10M for the development of binational (Canada and the United States) codes and standards for low-carbon vehicles and infrastructure.

There has been significant progress made in the establishment of alternative fuel infrastructure in Canada with investments being made by the federal and provincial governments as well as the private sector, however, much more needs to be done. We are encouraged by the strong partnerships we have established with industry and our provincial counterparts and look forward to building and facilitating new strategic partnerships through our Phase 2 investments. Through Phase 1 investments ($16.4M), the Program deployed 102 electric vehicle fast-chargers, 7 natural gas stations and 3 hydrogen stations. Phase 2 investments ($80M) has notional targets of 900 electric vehicle fast-chargers, 15 natural gas stations and 12 hydrogen fuel cell stations.

This Program supports the implementation of the Pan-Canadian Framework on Clean Growth and Climate Change.

1. About

4. How to apply

7. Service Standards

10. News and FAQs

2. Eligibility

5. After you apply

8. Successful Applicants - Phase 1

11. Infrastructure map

3. Before you apply

6. Request Application Package

9. Successful Applicants - Phase 2

12. Contact Us

> **NOTICE**
>
> The second Request for Proposals under Phase 2 of the Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative is now open. Applications are now being accepted. Applicants of successful projects will be notified by email by Summer 2019.

1. What this Program offers

The Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative (the Program) offers repayable contributions to support the construction of an electric vehicle (EV) fast charging, coast-to-coast, network. The funding also supports natural gas infrastructure along key freight corridors and hydrogen infrastructure in metropolitan centres.

How much can you receive?

NRCan's repayable contribution through this Program will be limited to a maximum of five million dollars ($5,000,000) per project.

For EV fast chargers, the Program will pay up to 50% of the total project costs to a maximum of fifty thousand dollars ($50,000) per charging unit.

For natural gas and hydrogen refuelling stations, the Program will pay up to 50% of the total project costs to a maximum of one million dollars ($1,000,000) per refuelling station.

Investing in Canada: Canada's Long-Term Infrastructure Plan

Through the Investing in Canada infrastructure plan, the Government of Canada is investing more than $180 billion over 12 years in public transit projects, green infrastructure, social infrastructure, trade and transportation routes, and Canada's rural and northern communities.

Date Modified:
2019-02-28

Zero Emission Vehicle Infrastructure Program – Eligibility

1. About | 2. Eligibility | 3. Before you apply
4. How to apply | 5. After you apply | 6. Request Application Package
7. Service Standards | 8. Successful Applicants | 9. News and FAQs
10. Contact us | 11. RFP Calendar

NOTICE

The Request for Proposals (RFP) focusing on public places, on-street, multi-unit residential buildings, workplaces and light-duty vehicle fleets is now open until **June 22, 2021** (23:59 Eastern Daylight Time). NRCan will target having **funding decisions by October 2021.**

****Temporary Measure - Extended Project Completion****

As the second wave of COVID-19 continues to cause supply chain disruptions and operational restrictions, the Program is now allowing up to an additional 12 months to complete projects. As a result, proponents may have up to 30 months from the date of agreement signature for the completion of EV charging projects, and up to 36 months from the date of agreement signature for hydrogen refuelling projects.

Note that the completion date indicated in a signed contribution agreement takes precedence. Therefore, to avail yourself of this accommodation, you must contact your NRCan project officer or email nrcan.taf-tcr.rncan@canada.ca, as an amendment to existing agreement will be required.

The following eligibility requirements apply to the RFP for all streams (public places, on-street, multi-unit residential buildings, workplaces and light-duty vehicle fleets). Please note that other infrastructure streams may have different requirements.

Eligible Recipients:

Legal entities validly incorporated or registered in Canada* including not-for-profit and for-profit organizations such as:

- Electricity or gas utilities;
- Companies;
- Industry associations;
- Research associations;
- Standards organizations;
- Indigenous and community groups;
- Academic institutions; or
- Provincial, territorial, regional or municipal governments, or their departments or agencies where applicable.

International legal entities validly incorporated or registered abroad* including for-profit and not-for-profit organizations such as:

- Companies;
- Industry associations;
- Research associations;
- Standards organizations; or
- Academic institutions.

*With your application, please provide a copy of the articles of incorporation or registration to confirm that your organization is validly incorporated or registered (this is not required for provincial, territorial, regional or municipal governments).

Eligible Projects and Technologies:

In order to be considered for funding, the Project must meet the following requirements:

- Increase localized charging or hydrogen refuelling opportunities in public places, on-street, in multi-unit residential buildings, at workplaces or for light-duty vehicle fleets, as defined in Section 1.1 of the Applicant's Guide;
- For EV charger projects, your proposal must include:
  - A) a minimum of two (2) fast chargers of 50 kW and above; **OR**
  - B) if installing less than two (2) fast chargers of 50 kW and above, a minimum of twenty (20) chargers of all charging levels.

  For Level 2 chargers, each connector can count as a unit towards the minimum 20 chargers if each connector can charge a vehicle at the same time.
- Be an eligible technology as described in Section 1.1 of the Applicant's Guide;
  - SAE J1772 standard plug head (Level 2 (208/240 V)
  - SAE J1772 Combo (for fast chargers)
  - CHAdeMO (for fast chargers)
  - Other proprietary charging connector types (maximum of 75% of all connectors for each site)
  - For hydrogen refuelling projects, the station must be capable of dispensing hydrogen at 700 bar minimum.
- Be located in Canada;
- Be a permanent installation (mounted or fixed models);
- Be new and purchased equipment (not leased);
- Be for a new installation or expansion of an existing installation (not for the replacement of an existing installation);
- Be connected as defined in Section 1.1.1 of the Applicant's Guide;
- The work performed must be in compliance with all applicable local codes (for example, building and electrical) and bylaws (for example, zoning and parking);
- Be certified for use in Canada (e.g CSA, UL, Interlink) and be commercially available.
- Charging infrastructure targeting general public use must be installed in a parking space clearly identified for the purpose of charging electric vehicles; and
- The project timeline must show completion within thirty (30) months for charging infrastructure and within thirty-six (36)* months for hydrogen refuelling infrastructure from the date of the contribution agreement signature. The distribution of Letters of Conditional Approval (LOCA) are expected in October 2021 and applicants of successful projects will have six (6) months after the LOCA to sign a contribution agreement. (see Section 1.9 in the Applicant's Guide for information on timelines for Letters of Conditional Approval).

***As the second wave of COVID-19 continues to cause supply chain disruptions and operational restrictions, the Program is now allowing up to an additional twelve (12) months to complete projects.**

Did you know that you can optimize your savings with ENERGY STAR® certified EV chargers?

ENERGY STAR certified Electric Vehicle (EV) chargers use 40% less energy in standby mode, while providing the same functionality as non-certified products and meeting safety requirements. Find ENERGY STAR certified models available in Canada using the ENERGY STAR Product Finder tool.

Québec Infrastructure Projects

The *Act Respecting the Ministère du Conseil Exécutif* (M-30) may apply to an Applicant in the Province of Quebec. Applicants may be required to complete an additional information form and, if they are subject to the requirements of the Act, to obtain written authorization and approval from the Government of Quebec prior to execution of any Contribution Agreement. The Program will follow-up with the Applicant during the application assessment, as required.

Electric Vehicle Fast Charger Projects Located in British Columbia

Projects in British Columbia (BC) that include electric vehicle fast chargers of 20 kW and above with SAE J1772 Combo (CCS) and CHAdeMO connectors available for public use or for on street charging, and selected for funding under NRCan's Zero Emission Vehicle Infrastructure Program could also be eligible for additional non-repayable provincial funding. Refer to Section 1.4.1 in the Applicant's Guide for further information.

Eligible expenditures:

IMPORTANT NOTE:

- Successful Applicants will be notified through a Letter of Conditional Approval and will be invited to begin negotiating a contribution agreement.
- Natural Resources Canada can only reimburse eligible expenditures during the eligible expenditures period. This period starts when Canada signs the contribution agreement.
- The expenditures incurred between the receipt of the Letter of Conditional Approval and the date on which a contribution agreement is signed by Canada fall outside of the eligible expenditures period and cannot count towards total project costs or be reimbursed by Natural Resources Canada.

Eligible expenditures for an approved Project under the Program must be directly related to, and necessary for, the implementation and conduct of the Project and include:

- Salary and benefits;
- Professional services (e.g. marketing; data collection; logistics; printing; distribution);
- Reasonable travel costs, including transportation, meals and accommodation;
- Capital expenses, including informatics and other equipment or infrastructure;
- Rental fees or leasing costs;
- License fees and permits;
- Costs associated with Environmental Assessments;
- GST, PST and HST net of any tax rebate to which the recipient is entitled; and
- Overhead expenses directly related to the project, included in the 15% maximum of NRCan funding, will be considered to a maximum of 15% of Eligible Expenditures.

Ineligible Expenditures:

Ineligible expenditures for reimbursement under this Program include:

- In-kind;
- Land costs;
- Legal costs;
- Ongoing operating costs and;
- Costs incurred outside the Eligible Expenditure Period.

PROGRAM GUIDE FOR
CleanBC Go Electric Public Charger Program

Date: December 4, 2020

Funded by the Province of British Columbia

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Abbreviations

B.C. – British Columbia

DCFC – Direct Current Fast Charger

EV – Electric Vehicle

FBC – Fraser Basin Council

MEMPR - Ministry of Energy, Mines and Petroleum Resources

OCPP – Open Charge Point Protocol, v1.6 or higher

ZEV – Zero-Emission Vehicle

Glossary of Terms

Dual Standard – A DCFC that possesses both CHAdeMO and Combined Charging System (CCS) Combo 1 plugs; simultaneous charging capability not required

Indigenous community - A First Nation (i.e. Band government) or its wholly owned subsidiaries (e.g. development corporations)

Interface – The controls and/or screen (as applicable) used to operate a charger

Multi-Port Charger – Single charger that can charge more than one vehicle simultaneously

OCPP Compatible – Property of a charger having OCPP installed, and able to be controlled by any OCPP network operator upon agreement with the charger's owner, i.e. not limited by hardware, software or contract (except for a limited, defined term) to any one network operator

Tandem Installation – Project where more than one DCFC is installed at the same location as part of a project

1.0 ***Program Overview (Management and Communications)***

1.1 Program Summary

The CleanBC Go Electric Program is intended to encourage and accelerate the adoption of zero-emission vehicles (ZEVs) in British Columbia (B.C.) for both their environmental and economic benefits. The CleanBC Go Electric Public Charger Program (Program) is a sub-program of the CleanBC Go Electric Program and is intended to increase the number of public Direct Current Fast Chargers (DCFCs) throughout B.C. to support the growing number of ZEVs on the road. The Program aims to target current gaps in the public DCFC network in B.C. such as Indigenous communities, rural and northern areas, and city centers experiencing long queues for DCFCs due to high ZEV uptake.

The Program will provide varying rebates of up to $80,000 per charge port depending on charger output, to a maximum of 50% of project costs, with enhanced rebates of up to $130,000 per port, to a maximum of 90% of costs for Indigenous communities (see section 3.1). The Program will also provide rebates for co-located Level 2 stations with DCFCs, up to $5,000 per station, to a maximum of 50% of costs (90% for Indigenous communities). The target number of DCFC ports to be installed from the Program is 80 and for Level 2 stations is 60. The total Program funding available for charger rebates is $5,076,000.

This Program Guide serves as direction for the CleanBC Go Electric Public Charger Program, and identifies the requirements for administration, implementation, and oversight of the Program. The document may be periodically updated as needed to clarify Program requirements and improve Program effectiveness.

1.2 Program Management & Administration

The Ministry of Energy, Mines and Petroleum Resources (MEMPR) is responsible for overall CleanBC Go Electric Public Charger Program management. Fraser Basin Council (FBC) will administer the Program on behalf of MEMPR.

In order to meet CleanBC Go Electric Program targets, MEMPR may modify any component of the Program. Program modification may include but is not limited to:

- Rebate eligibility criteria; and,
- Funding caps

The Program will be regularly reviewed and evaluated by MEMPR staff. MEMPR reserves the right to change or terminate the Program at any time without notice.

1.3 Program Communications

The application forms, eligibility requirements and applicable rebate amounts will all be accessed online. The CleanBC Go Electric Public Charger Program and application

process will be added as a page/subpages on FBC's Plug In BC website (https://pluginbc.ca/publiccharger/), using the CleanBC Go Electric branding. The Program page will link back to the CleanBC - Go Electric website (https://goelectricbc.gov.bc.ca/). FBC will use internal capacity to support the initial design and creative work to help with the set-up of the key marketing elements in a timely way. Ongoing updates will be done by FBC staff.

Enquiries related to the administration of the Program including, but not limited to, eligibility requirements, and application processing, should be directed to FBC at: PublicCharger@pluginbc.ca

Enquiries related to the overall design of the Go Electric B.C. Public Charger Program can be directed to MEMPR at: CEVEnquiries@gov.bc.ca

2.0 ***Program Criteria***

2.1 Applicant Eligibility

Applicants must apply and be approved for Program rebate(s) before any costs are incurred. Any costs incurred before approval was received will not be eligible for a rebate(s) and cannot be counted toward eligible expense totals. After approval is received, applicants will have 18 months to complete projects and submit final documentation.

To be eligible for the Program an applicant must:

- Be the current site owner or have approval (in writing) from the site owner to install the charging infrastructure for a minimum ten-year period; and,
- Be a business, not-for-profit, local government, Indigenous community, utility or public sector organization located and operating in B.C. (*excluding* core government entities, i.e. Provincial Ministries, but *including* non-core entities, e.g. utilities, health authorities, school districts, universities, crown corporations, etc.)

2.2 Installation Site Requirements

To be eligible for the Program a project's charger installation site must be:

- Located within B.C.;
- Publicly accessible 24 hours per day, 365 days per year; and,
- Accessible by those using mobility aids (wheelchairs, canes, etc.), including:
    - A space of at least 1.2 m between any protective bollards in front of the charger, such that they do not obstruct interface (i.e. screen and/or controls);

- A rise not exceeding 9 cm above grade for any concrete footing;
- Fonts that are clear and easy to read on any signage;
- A parking space that is:
    - Not less than 2 400 mm wide and provided on one side with an access aisle not less than 1 500 mm wide;
    - Located on a paved level surface.

2.3 Equipment Requirements

To be eligible for the Program all equipment must:

- Be new, and purchased after program launch date;
- Remain operational by the original owner for a minimum of five years, or be replaced with a charger of equal or higher output that remains operational for five years from the date of the original project installation. Changes in equipment ownership within the five year period may be considered in extenuating circumstances (e.g. due to sale of a business) and must be approved to maintain Program funding;;
- Contain appropriate certification marks (CSA, cUL, cETL, etc.) for use in B.C.;
- Have a method of payment that does not require a charging network account, if payment is required;
- Have charging port holsters and the top of interface not exceeding 1.2 m above grade;
- Remain accessible to the public for use 24 hours per day, 365 days per year;
- Include an Operating and Maintenance Plan;
- Not replace an existing charger.

To be eligible for the Program DCFC equipment must:

- Be dual standard (CHAdeMO and Combined Charging System (CCS) Combo 1 plugs);
- Be networked and be OCPP compatible by the date of installation;
- Have a minimum power output of 20 kW.

To be eligible for the Program Level 2 equipment must:

- Have a J-1772 port;
- Have input power at 208 or 240 volts;
- Have a minimum power output of 32 amps.

2.4 Eligible Project Costs

Costs eligible for rebates through the Program will be:

- Dual standard DCFC equipment;
- Co-located Level 2 stations;
- Installation costs such as labour and materials, including:
    - Necessary electrical equipment (e.g. cabling and conduit, transformer)
    - Earthworks;
    - Paving of one parking space per charger;
    - Curb and/or protective bollards around chargers;
    - Lighting directly above or adjacent to chargers (within 5 m);
    - Network equipment (e.g. cellular booster);
    - Way finding and on-site signage pertaining to the chargers (e.g. location, output, time limits, instructions for use);
    - Site markings (e.g. pavement painting);
    - One security camera per charger;
- Project management and engineering design fees;
- Tesla CHAdeMO adapter;
- Utility provider fees for electrical connection; and,
- Network service provider initial sign-up fees; and,
- Equipment warranty.

2.5 Final Project Documentation Requirements

To receive rebate funds applicants must submit the following documentation after DCFC (and Level 2, if applicable) equipment is installed and operational:

- Invoice for DCFC equipment (and Level 2 equipment, if applicable);
- Itemized invoice for DCFC (and Level 2, if applicable) installation;
- Copy of network agreement;
- Photo of installed DCFC (and Level 2, if applicable) equipment; and,
- Proof all eligible equipment, (DCFCs and Level 2s, as applicable) is/are operational.

3.0 ***Rebate Overview***

Applicants are eligible for three rebate tiers to cover up to 50% of the eligible costs of DCFCs with power outputs of ≥20kW (but less than 50 kW), ≥50kW (but less than 100 kW), and ≥100kW. Indigenous communities will be eligible for higher rebates at each tier, to a maximum of 90% of total project costs. Level 2 chargers installed as part of a funded DCFC project are eligible for a rebate of up to 50% of the additional cost or 90%

for Indigenous communities. Indigenous communities refer to a First Nation (i.e. Band government) or its wholly owned subsidiaries (e.g. development corporations). To receive an Indigenous community rebate, the Indigenous community must own the equipment; a third-party that owns and installs equipment on Indigenous lands is not eligible for the enhanced rebates.

Prospective installation locations greater than 500 m from the nearest public charger (Level 2 or DCFC) will be required to install either tandem DCFC stations or a co-located Level 2 station (minimum 32 A; higher power preferred) to provide redundancy to the site. Installation of both multiple DCFCs and one or more Level 2s per site will also be supported. A multi-port station on its own does not fulfill this requirement.

The applicant will be responsible for ongoing operation and maintenance costs associated with the DCFC and will be required to prepare an Operating and Maintenance Plan for its charger(s).

Rebates may be capped at 10 per organization to reserve funds for other organizations.

3.1 DCFC Funding Tiers

Applicants are offered three tiers of rebates for DCFC stations with: 1) output of 20kW or greater, but less than 50 kW; 2) output of 50 kW or greater but less than 100 kW, and 3) output of 100 kW or greater. Rebate amounts are as follows:

Charger Output	Maximum Rebate Amount	Maximum Rebate Amount for Indigenous Communities
DCFC: ≥20 kW, but <50 kW;*	$20,000; up to 50% of project costs	$50,000; up to 90% of project costs
DCFC: ≥50 kW, but <100 kW;	$50,000; up to 50% of project costs	$100,000; up to 90% of project costs
DCFC: ≥100 kW	$80,000; up to 50% of project costs	$130,000; up to 90% of project costs
Level 2: ≥32 amps	$5,000; up to 50% of costs	$5,000; up to 90% of costs

* under conditions identified in section 3.4

3.2 Level 2 Additions

To provide contingency charging in the case a station is occupied or not functioning, Level 2 chargers installed in tandem with DCFCs as part of the Program will be eligible for an additional maximum of $5,000 in project funding per Level 2 charger (≥32 A), to

a maximum of $10,000 per installation site (percentage caps still apply). Level 2 stations are not required to be networked.

3.3 Tandem or Multi-Port DCFC Installations

Tandem and multi-port DCFCs are eligible for one rebate for each vehicle that can charge simultaneously at a given output level. For tandem DCFC stations a 75% funding limit will apply while the combined dollar cap will remain the same. The funding amount of multi-port stations will be based on the maximum simultaneous output level of operating ports.

For example, if the total cost for two tandem 50 kW stations is $180,000, the applicant is eligible for 2 x $50,000 rebates = $100,000.

Multi-port stations must be accompanied by an additional charging station (DCFC or Level 2) on the same site.

3.4 Station Output Level Conditions

In order to ensure effective deployment of charging stations under the Program, the following are guidelines for DCFCs with charging output levels of <50 kW.

Stations with less than 50 kW output would be eligible under the following conditions:

- In urban centres (i.e. within Census Agglomerations or Census Metropolitan Areas with a population of 100,000 or greater);
- In areas not located on or near primary, secondary highways or major roads, as defined by the B.C. Ministry of Transportation and Infrastructure;
- As part of a tandem installation with a ≥50 kW DCFC;
- Where an electrical service extension (and/or service upgrade, as applicable) to accommodate a ≥50 kW station would be cost prohibitive.

3.5 Pilot Projects

DCFC pilot projects (e.g. for car sharing, ride hailing, taxi, battery storage stations, etc.) may be considered through this Program if they are able to demonstrate public benefit. Specific eligibility criteria may be developed for pilot projects.

4.0 ***Application Process***

Applicants can find Program information, criteria, application forms and other relevant information on FBC's Plug In BC website (https://pluginbc.ca/publiccharger/). Applications will be submitted online and must receive approval before any works begin. Any costs incurred before approval was received will not be eligible for a rebate(s) and

cannot be counted toward eligible expense totals. Applicants who do not own the site they plan to install a DCFC at will need to include a written agreement demonstrating right to use the site with their application for a ten-year period.

Applications will be reviewed on a minimum two-month cycle, or more frequently depending on application volume. Once a decision has been made, applicants will be notified by email if they have been successful; remaining applications will be retained for future review periods.

Preference will be given to applications that:

- Fill existing DCFC network gaps and/or underserved areas (e.g. Indigenous communities, rural and northern areas, communities with high ZEV uptake, high concentrations of existing multi-unit residential buildings, etc.);
- Are co-located with primary amenities (lighting, washrooms, non-cellular wireless (i.e. WiFi) internet available at all times);
- Are co-located with one or more additional DCFCs;
- Are located near secondary amenities, such as restaurants, shopping and attractions (e.g. parks, libraries, community centres, etc.);
- Include stations ≥75 kW when located on primary and secondary highways, where feasible;
- Include stations able to deliver ≥120 A of electricity, if proposing DCFCs with output ≥50 kW but <100 kW;
- Include Level 2 stations with a higher output than 32 A, if Level 2 stations are proposed;
- Include an on-site Tesla CHAdeMO adapter;
- Include capability to add of future DCFCs (e.g. space on site, oversized conduit, etc.)
- Agree to provide data on charger usage;
- Include site design drawings;
- Include an operating and maintenance plan as part of the original application;
    - for more guidance see BC Hydro's EV Fast Charging Design & Operational Guidelines at https://www.bchydro.com/powersmart/electric-vehicles/industry/fast-charging.html).

Once approval is received, applicants will have an 18-month window to install their DCFC(s) (and Level 2(s) if applicable) and submit final project documentation. FBC will review the final documentation for completeness and will then issue rebates. The items below lay out the steps for applying, receiving approval, and receiving the rebate:

- Application for station(s): Applicant creates an online profile and applies for the number of stations desired, including information on organization type and

documentation, site description, proof of site ownership or permission of the landowner, charger type(s) and output(s), capital budget/quotation (including site acquisition/lease (if applicable), permits, design, electrical service extension, site preparation/civil works, electrical equipment, charger, lighting, and signage), and site design drawings (optional), and operating and maintenance plan (optional at application phase).

- Screening and pre-approval: FBC staff screen applicants for eligibility and move forward applicants that meet mandatory criteria.
- Station approval: in consultation with MEMPR staff, FBC approves applications based on a diversity of geographic and usage types. Applicants then have 18 months for implementation. FBC staff will check in periodically to assess progress. Projects that may require advance payments to manage the cashflow, might have the option to be funded through an up-front contribution agreement.
- Completion report: Applicant provides completion report including documentation, photos, financial report and copies of invoices to verify costs. These will be submitted online via the application platform. FBC will reserve the right to make on-site audits for projects if required. An Operating and Maintenance Plan must be submitted at this stage. An Operating and Maintenance report template is available on FBC's Program website (https://pluginbc.ca/publiccharger/) but an alternative format may be used, as long as it contains the following elements:
    - Service stability
        - Charger up-time targets
        - Performance monitoring (e.g. testing, remote, crowdsource, etc.)
        - Ensuring access
            - Cleaning interface
            - Clearing/plowing area
            - Lighting
            - Preventing blocking by vehicles not charging
        - Regular maintenance/warranty
        - Staff training
            - Customer service (on site/remote)
            - Operation/signup walkthrough
            - Resetting device

        - Nearby charging locations
        - Local towing companies
    - Incident response plan (e.g. for device failure, vehicle impacts, tampering/vandalism, etc.), including:
        - Response procedures (e.g. shutdown, fire department, repair/replacement, etc.)
        - Service provider and/or warranty service
        - Response time targets
        - Public notification of failure
        - Spare parts supply/inventory
        - Graffiti removal
- Cost of electricity (including demand charges)
- Network fees
- Revenue collection strategy (if applicable)
- Insurance

Station utilization data: Successful applicants are encouraged to provide usage data for DCFCs funded under the Program, for a minimum period of five years from the date of installation. Usage data includes information related to charging sessions (i.e.: start/end time, duration, energy, power per minute, peak power) but excludes personally identifiable data. Successful applicants will work with the Ministry of Energy, Mines, and Petroleum Resources to determine the best tools and methods for data sharing.

For example, successful applicants can send station utilization data in the format of an annual report that includes a record for each charging session during the year, its start and end time, the maximum charging rate (kW), the energy delivered (kWh), and the charging connector type. It should not contain any personally identifiable information of users (names, membership numbers, credit card numbers). Acceptable formats are .xls, .xlsx, and .csv.

Final documentation will also be submitted online. Printable or paper application forms may be requested from FBC in extenuating circumstances. New stations funded under the Program will be entered into charging station databases (e.g. Chargehub, Plugshare, etc.) with a link to the Program webpage.

5.0 ***Interaction with Other Programs in Market***

There are two other programs currently in market that offer rebates for DCFCs and can be accessed for B.C. based DCFC projects. The two programs are:

- Natural Resources Canada (NRCan) Zero Emission Vehicle Infrastructure Program (ZEVIP); and,
- NRCan Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative (EVAFIDI).

Both programs provide maximum federal funding of 50% of total project costs to a maximum of $50,000 per DCFC. Currently MEMPR has partnered with NRCan on both programs to provide additional funding for B.C based DCFC projects. Successful applicants completing DCFC projects in B.C. are automatically eligible for B.C. funding. MEMPR funding provides a maximum of $25,000 per DCFC to a max of 25% of the total project costs (on top of the federal $50,000 funding). Any station that receives MEMPR funding through the ZEVIP or EVAFIDI will not be eligible for funding through the CleanBC Go Electric Public Charger Program.

The stacking of provincial funding with ZEVIP, EVAFIDI, and other CleanBC Programs is not permitted. Stacking of funding from other government funding programs with the Public Charger Program will be limited to 75% of eligible project costs, except in the case where the applicant is a local or Indigenous government or their department or agency in which case the stacking limit for government funding is 100% of the total project costs. Funding from other sources will be allowed as long as funding amounts do not exceed total project costs. Reporting of application for other government funding for the use toward a project funded under the CleanBC Go Electric Public Charger Program is mandatory.

THE MUNICIPALITY OF THE VILLAGE OF LIONS BAY

Type	**Information Report**		
Title	**Village of Lions Bay GHG Targets, Policies and Actions**		
Author	**Peter DeJong**	**Reviewed By:**	
Date	**May 21, 2021**	**Version**	
Issued for	**May 25, 2021**		

Recommendation:

THAT the Information Report, "Village of Lions Bay GHG Targets, Policies and Actions" be received.

Attachments:

(1) Official Community Plan, section 9
(2) Solid Waste Data 2008-2020

Key Information:

At the April 13, 2021 Council meeting, Council passed a declaration recognizing that climate change constitutes an emergency for the Village of Lions Bay. At the request of the Climate Action Committee, the following resolution was also passed:

THAT Staff be directed to report back at the May 25, 2021 regular Council meeting regarding:

a. actions referred to in Section 9 of the OCP as amended that the Village is presently taking to reduce GHG emissions (corporate and community) and performance metrics regarding emission targets;
b. actions the Village is presently taking to adapt to climate change.

In 2010, the Village of Lions Bay Official Community Plan (OCP) was amended to include section 9 entitled "Greenhouse Gas Emission Reduction Strategy: Targets, Policies and Actions" (see attached). This report provides a synopsis of the progress, or the lack thereof, in respect of these targets, policies and actions and comments on some adaptation actions.

9.1 Targets

The targets referenced the Community Energy and Emission Inventory (CEEI) produced by the Province in 2007 which reported that 92% of GHG emission in Lions Bay were due to transportation related activities and only 8% related to buildings. The accuracy of those

figures were questioned and there was a hesitancy to rely upon them as a baseline. There was a preference to focus on conversion of homes using fossil fuels in order to have the largest impact on the environment and benefit home owners financially over time. Nonetheless, while recognizing that new baseline data was needed, emission reduction targets were set for 2020 in the areas of:

Transportation - 3% re. increased transit use and ride shares, and
- 30% re. use of smaller (and presumably more efficient) vehicles over time

Buildings - 11% re. conversion of oil heat to renewable energy heating and greater Energy efficiency,
-3-4% through conservation measures

Solid Waste - 50% reduction

Overall Community – 20%

There was no distinction made in the targets between corporate (i.e. municipal buildings and operations) vs. community goals and the targets themselves are fairly nebulous. From 2011 through 2015, other than annual solid waste reporting, there appears to have been no collection of baseline data or attempts to quantify emissions, something that is difficult for a small community to accomplish in any event, but particularly difficult in a period of constant staff and management turnover. Available records will be compiled and accessible on the municipal website going forward.

9.2 Policies

A number of policy ideas were laid out under the following headings:

<u>Transportation</u>

a. *Increase transit options north and south of Lions Bay*

The regional transit initiative spearheaded by the communities up the Sea to Sky Corridor was gaining steam under the previous provincial government, but has been stymied under the current government. Planners at both TransLink and BC Transit know that we are very interested in being a part of any regional service that passes through the Village.

Prior to the pandemic, progress was being made on increased service for Lions Bay in terms of both evening and weekend schedules and commitments were in hand from

TransLink. Efforts were also progressing to address the connection gaps, particularly at Horseshoe Bay. It is hoped that transit service will rebound strongly once the populace is fully vaccinated, and these service initiatives will be revisited. We do not have baseline ridership data from TransLink but will track going forward.

b. *Car pooling/ride sharing/ride hailing*

These kinds of services have largely dried up during the pandemic but did not have much traction pre-Covid in any event. Promotion of transit use is planned through the LB Avenue Connector Project construction of a bus shelter at the Park & Ride location and improvement of service options. However, Lions Bay did join with a number of other municipalities in enacting Inter-Municipal Business Licensing (IMBL) for Ride Hailing (eg: Uber, Lyft, etc.) and the staff report and draft bylaws can be accessed from the online agenda materials for the March 3, 2020 Council meeting. License fees favour zero emission vehicles.

c. *Support Low Emission Vehicles*

Efforts have been ongoing for the past year to obtain grant funding for a DC Fast Charger for Lions Bay. The project is challenging and both staff and Council are grappling with how best to overcome these challenges.

d. *Transit education and assistance*

Surveys have been conducted in the past couple of years and this has helped to both promote knowledge of the service and get important feedback to push for increased and better transit services. Transit recovery from the onset of the pandemic has been slow.

e. *Safe and protected transit shelters*

There is a shelter at Kelvin Grove southbound and a new shelter was installed a couple of years ago on Crosscreek in front of the municipal complex. The bus stop at the Brunswick underpass is sheltered and the LB Avenue Connector Project will result in a new shelter at the Park & Ride location.

f. *Enhance trail network to encourage pedestrian mobility*

The Lions Bay Avenue Connector Project will improve the trail connection between Kelvin Grove and the Village Core, including getting pedestrians and bikes off the

southbound on-ramp at LB Avenue. It will also provide safe and protected connections from the top of the hill down Lions Bay Avenue to the beach park.

g. *Maintain and upgrade safe bicycle lanes*
The Bayview Avenue widening project is currently underway with the goal of enabling parked resident vehicles on the east side of the street to have 4 wheels off the pavement with no parking on the dedicated walking/biking lane. Parking plan changes will see similar preservation of the dedicated walking/biking lane on the west side of Bayview, between the school and Stewart Road. See also *f.* above.

Land Use / Building

h. *Provide for secondary suites through zoning amendments*
This objective has been accomplished and the Municipality has a streamlined process and a secondary suite registry with education and advice readily available.

i. *Explore options for new housing opportunities*
Zoning and Development Bylaw No.520, 2017 provides for additional cottages up to 115 square metres on properties over 1000 square metres.

j. *Continue to support home based businesses*
It is unclear how such businesses have been supported to date. There is no business licensing bylaw or licensing requirements so there is no data to understand how many home-based businesses there are in Lions Bay, what fields of endeavour they are engaged in, where they are located or how they can best be supported.

k. *New or expanded community centre*
The community hall renovation was completed in 2015.

l. *Accommodate new commercial activities in the central core*
The store and café have expanded and consolidated that space and other businesses have come and gone, with the latest addition being the new hair salon.

m. *Provide incentives to builders for alternative energy sources such as solar and geothermal*

This has been noted for consideration in a new building bylaw.

n. *Support micro hydro as an alternative power source for the Village*
This idea was explored several years ago and determined not to be feasible.

o. *Provide incentives to builders for more energy efficient homes*
This has been noted for consideration in a new building bylaw.

p. *Require newly rezoned dwelling units to meet LEED or Built Green standards*
This has been noted for consideration in a new building bylaw.

Solid Waste

q. *Support Metro Vancouver's Zero Waste Objectives*
Key initiatives include diversion of organics and enhanced recycling. Lions Bay is presently pursuing membership in Recycle BC to further enhance these goals. As well, an agreement was entered into in 2018 enabling residents to use the North Shore Recycling facility.

r. *Provide incentives and alternatives to residents to reduce quantities of waste*
There are three streams of waste: garbage, organics and recycling. Organics consist of food waste and yard waste. Attempts to disincentivize yard waste were not successful.

9.3 Actions

The following actions were to be considered as a means of implementing the policies:

a. *Review Zoning and Building bylaws to identify GHG reduction barriers and explore incentives to remove oil furnaces*
The zoning bylaw was re-done and the building bylaw is TBD.
b. *Develop educational programs and a toolkit re. climate change to promote energy efficiency and removal of oil heating.*
No evidence that this has been attempted. However, the agreement with Metro Vancouver delaying the implementation of the full provisions of their wood-burning

bylaw until 2032 requires that there be an ongoing educational component to the gradual transition to clean burning appliances to preserve Lions Bay's air quality.

c. *Use Climate Change Action Task Force to spearhead climate change initiatives and recommendations to Council.*
Substitute Climate Action Committee.

d. *Identify potential community garden sites and raise awareness about local food networks*
Community gardens were just rebuilt upon completion of the new Waste Water Treatment Plant at the entrance to Kelvin Grove Beach Park.

e. *Adopt and enforce an Anti-Idling bylaw*
This was adopted in April 2010 and provides for an offense or bylaw contravention if a person idles for more than 1 minute, subject to certain exceptions. Bylaw Officers have been reminded about enforcement of the bylaw.

f. *Investigate incentives for energy audits and retrofits*
No research has apparently been done.

g. *Provide trail corridors and connections to enhance pedestrian mobility.*
See Policies *f and g.*

h. *Provide info on interconnecting trails*
Trail Map was created and can be viewed online or in paper form at Village Office.

i. *Develop safe, accessible pathway from Brunswick to Central Lions Bay to Kelvin Grove*
The Centennial Trail and Kelvin Grove Trail were built in connection with the Sea to Sky Improvement Project.

j. *Request Province to update the CEEI and provide Village with tools and resources to monitor and measure the GHG reduction levels.*
No evidence that this was done.

k. *Collaborate with TransLink to remove barriers and make for a more desirable experience.*
Construction of bus shelters and coordination of transfers at Horseshoe Bay are two actions that have been taken.

l. *Review bylaw enforcement and penalties as a means of waste reduction*
Ticketing for waste infractions has been rare.

m. *Consider changes in waste management contract to examine a more efficient approach with respect to transporting waste out of the Village*
It is unclear what types of changes were conceived or anticipated.

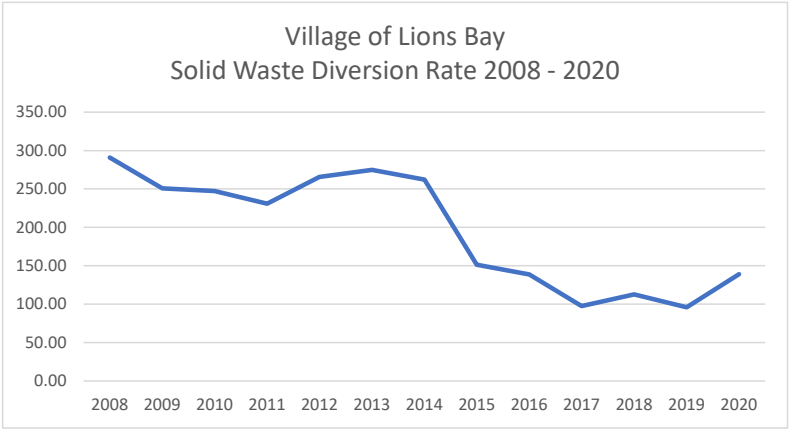
n. *Review feasibility of hydro electric energy production to determine if economically viable*
Micro hydro project deemed not feasible.

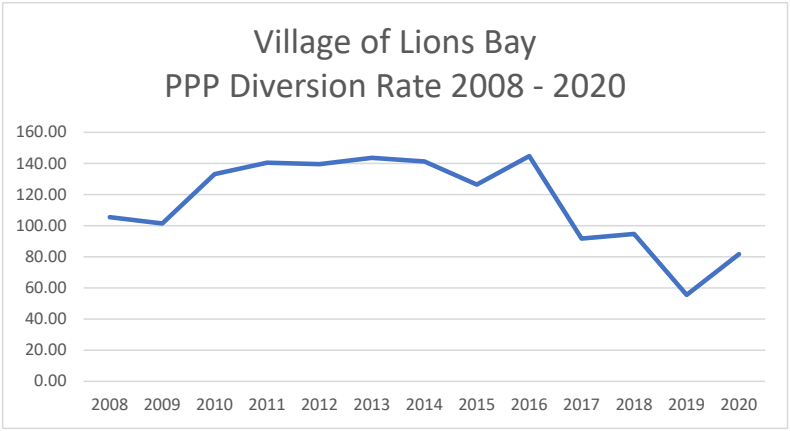
With respect to actions the Municipality is taking to adapt to climate change, there are several items to note:

- In 2018, draft Development Permit Area guidelines were compiled in respect of threats due to natural hazards but were never adopted. This included guidelines in respect of sea level rise and guidelines in respect of wildfire hazards. It should also be noted that the slope hazards identified will become more prevalent because of climate change. The need to resolve how the Municipality will address these issues going forward is a pending action within the Village of Lions Bay strategic plan. In the interim:
- Flood Hazard Assessments being required for development of waterfront properties
- Flood Mitigation Strategies being developed and implemented in West and North Vancouver municipalities to be reviewed.
- 2021 Community Wildfire Protection Plan pending.
- 2021 Firesmart grant funding for protective measures around critical infrastructure and for educational materials.

Follow Up Action and Communication Plan: To be determined.

YEAR	Mixed Paper	Mixed Containers	Total Recyclables	Yard and Food (2015)	Garbage
2008	72.95	32.61	105.56	165.26	290.89
2009	63.48	37.97	101.45	46.63	250.78
2010	79.92	53.18	133.10	89.08	247.42
2011	81.00	59.42	140.41	46.20	230.84
2012	79.29	60.23	139.52	106.44	265.52
2013	72.33	71.32	143.65	118.82	274.69
2014	71.26	69.95	141.21	99.19	262.23
2015	60.66	65.71	126.37	245.90	151.28
2016	72.29	72.44	144.73	276.34	138.60
2017	44.98	46.82	91.80	217.56	97.66
2018	37.72	56.93	94.65	252.40	112.63
2019	25.87	29.68	55.55	247.34	95.92
2020	41.72	40.08	81.80	319.63	138.88





Regional Environmental Change (2019) 19:1327–1337
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ORIGINAL ARTICLE

Socio-hydrology of "artificial glaciers" in Ladakh, India: assessing adaptive strategies in a changing cryosphere

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Abstract

The consequences of even small glacier decrease and changes of seasonal snow cover are critical for the functioning of meltwater-dependent mountain agriculture. In order to deal with recurrent water scarcity, different types of ice reservoirs, commonly called "artificial glaciers," have been introduced in Ladakh and promoted as appropriate adaptive strategies to cope with changes in the cryosphere. The resulting seasonal ice reservoirs increase meltwater availability during the critical period of water scarcity in spring. We examine the efficacy of 14 ice reservoirs through a long-term analysis of their functioning within the environmental and socioeconomic context of Ladakh. Using multi-temporal satellite data (1969–2017), close range photogrammetry, and repeat field measurements (2014 and 2015), we provide an inventory and typology of these ice reservoirs and estimate storage volume of one selected structure, which ranges from 1010 to 3220 m^3 of water. We extrapolate this volume to all ice reservoirs and estimate potential irrigation cycles of cropped areas, which vary between less than 0.1 in unfavorable cases and almost 3 in optimal cases and years. Based on interviews and field surveys (2007–2017), we discuss the benefits perceived by local smallholders, such as the reduction of seasonal water scarcity and resulting crop failure risks together with the possibility of growing cash crops. We argue that "artificial glaciers" are remarkably suited to the physical environment. However, their usefulness as a climate change adaptation strategy is questionable because climatic variability, natural hazards, and an incomplete integration into the local socioeconomic setting significantly reduce their efficacy.

Keywords Climate change adaptation · Cold-arid region · Ice reservoirs · Irrigated agriculture · Water conservation · Socio-hydrology

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Introduction

Meltwater from glaciers, snowfields, and permafrost is the most important source of irrigated agriculture in cold-arid mountain regions all over the world. In order to cope with insufficient or seasonally unreliable availability of water, adaptive techniques and sophisticated designs for water management and distribution have been established in diverse regional contexts (Kreutzmann 2011; Carey et al. 2017; Mark et al. 2017). The necessity of including socioeconomic dynamics in studying the evolution of human-water interactions has been stressed in the current discussion on socio-hydrology (Sivapalan et al. 2012; Wesselink et al. 2017; Nüsser 2017). Conceptual approaches under this umbrella term have the shared premise that human-water interactions are characterized by co-evolution of natural and social systems entangled in diverse feedback loops.

There is a long tradition of research on human-water relations in the upper Indus Basin, in both Ladakh, northern India (Labbal 2000; Nüsser et al. 2012) and various locations in northern Pakistan (Kreutzmann 2011; Nüsser 2001; Parveen et al. 2015; Nüsser and Schmidt 2017). Our study extends the socio-hydrological discussion to water harvesting structures in Ladakh, commonly called "artificial glaciers," which have been framed as adaptive strategies to climate change (Bagla 1998; Vince 2009; Clouse 2014). Land use in the cold-arid region of Ladakh has always been prone to seasonal water scarcity, affecting irrigation and domestic water supply (Dame and Mankelow 2010; Nüsser and Baghel 2016). Due to low temperatures and the high variability of seasonal snow cover (Mukhopadhyay and Khan 2015), there is a typical shortage of water at the onset of the agricultural season for about 2 months until a sufficient and reliable supply of meltwater from high-altitude glaciers becomes available. "Artificial glaciers," located at much lower altitudes than the naturally occurring glaciers above 5200 m a.s.l. (Schmidt and Nüsser 2017), serve to bridge the critical gap in water availability by providing ice reservoirs that melt earlier in the agricultural season. Such ice reservoirs have been constructed in several tributaries of central Ladakh over the past three decades (Fig. 1). In spite of the popularity of the term "artificial glacier," the term "ice reservoir" conveys their character and function more accurately because the ice bodies only exist for a few months, unlike glaciers in the strict sense, which are defined as perennial, moving ice bodies with distinct accumulation and ablation zones.

Such ice reservoirs utilize the hydrological process of icing under local conditions of frequent freeze-thaw cycles to capture water for seasonal storage. They are not water storage structures that freeze from the top down, rather they are produced through sequential, freezing of thin layers of water creating superimposed sheets of ice. These ice reservoirs are maintained as communal infrastructure reliant on local institutions and external technological interventions. Published quantifications of their ice storage capacity differ between 17,000 and 23,500 m^3 (Bagla 1998; Norphel and Tashi

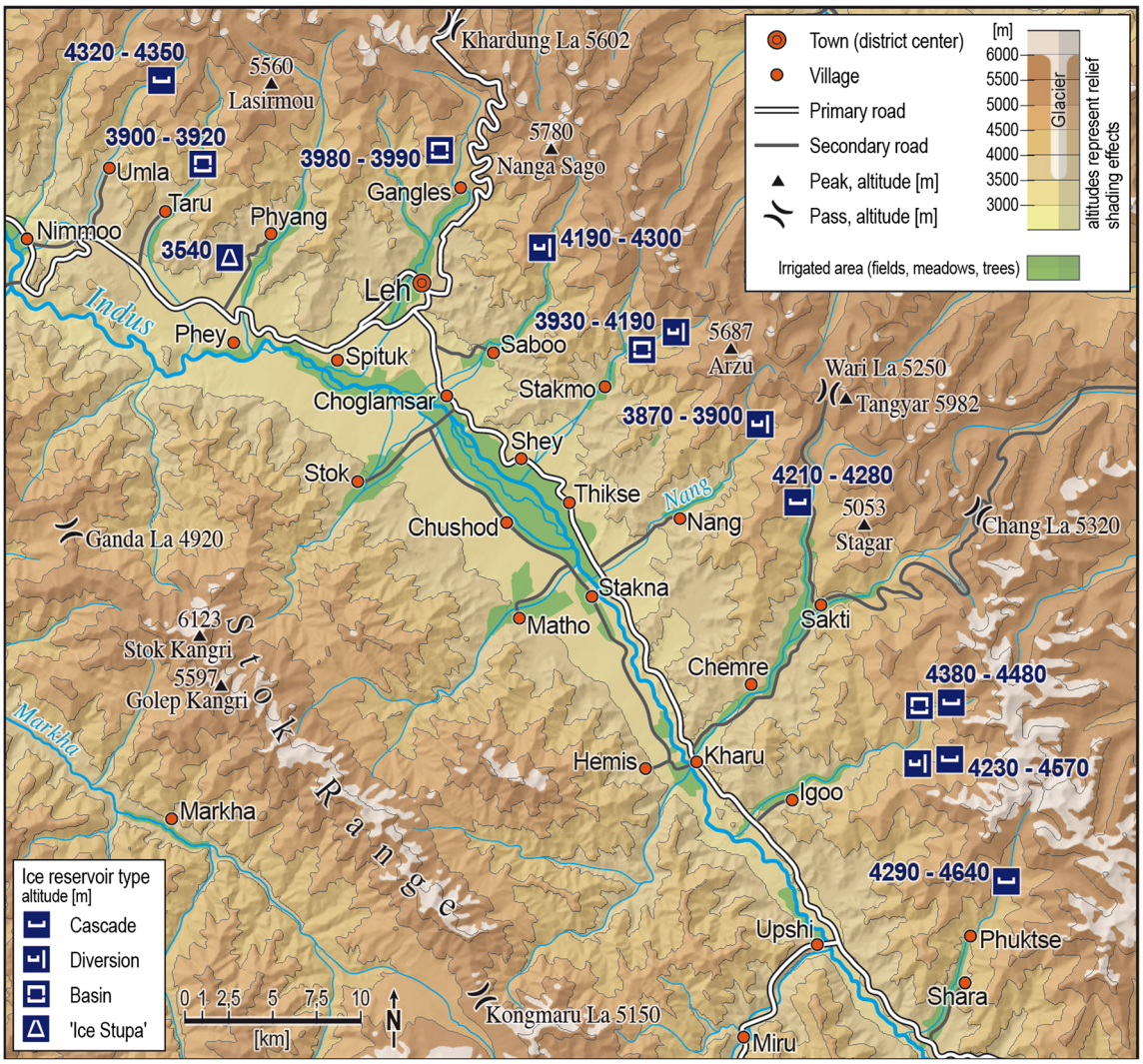

Fig. 1 Ice reservoirs in central Ladakh

2015). Recent research has called for an examination of their long-term efficacy and their usefulness as climate change adaptation strategies (Clouse et al. 2017). We attempt to address this gap through a longitudinal study that takes into account their functioning as supplementary irrigation, as interventions to foster sustainable development, and their usefulness as adaptation strategies to global climate change. Based on multitemporal satellite data (1969–2017), close range photogrammetry, and repeat field measurements (2014 and 2015), we provide an inventory and typology of these ice reservoirs and estimate storage volume of one selected structure. The extrapolation to other ice reservoirs allows to estimate the number of potential irrigation cycles. Between 2007 and 2017, empirical social research methods were employed to investigate the nexus of glacio-hydrological processes and local mountain livelihoods. This study from a cold-arid mountain region can inform evaluations of the efficacy and transferability of climate change adaptation strategies and stresses the importance of site-specific socio-hydrological interactions.

Material and methods

An integrated approach, based on remote sensing analyses and socioeconomic surveys, was used to examine the functioning of ice reservoirs in central Ladakh. Ice reservoirs were identified and mapped on high spatial resolution satellite imagery in ArcMap (ESRI). Corona data from 1969 were used to identify conditions existing prior to the first reported construction in Ladakh, explicitly identified as an "artificial glacier" in 1987. Time series of all available Landsat imagery from 1989 to 2017 available at the USGS archive, with cloud cover of less than 30% were used to classify sites as ice filled, snow covered, free of snow and ice, or cloud covered, in order to evaluate the functioning of the structures. Visual interpretation and manual classification were carried out for all sites, based on the months of April and May as proxies for the extent of ice formation at the onset of the agricultural season and the period between November and March for the extent in winter months. In case of differences in ice formation between images taken in April and May, the greater extent was selected where data for both months were available. The elevations of different ice reservoirs were derived from ALOS Digital Surface Model.

Functioning of ice reservoirs was further verified using repeat photography, conducted in February and October 2014. The volume of one selected ice reservoir was estimated using a structure from motion (SfM) photogrammetry approach (Westoby et al. 2012; Fonstad et al. 2013; Smith et al. 2016) with two fine-grained DEMs (0.1×0.1 m^2), generated from several hundred photos using the photogrammetry software PhotoScan (Agisoft). Ice volume of the test site (Nang reservoir) was determined based on the difference between winter and summer DEMs in 2015 (online supplement). Volumes of ice reservoirs were calculated from this example using surface-area-to-volume ratio and multiplied by 3 to denote inter-annual variability between optimal and unfavorable years. Potential irrigation cycles of cropped areas were calculated based on field observations and estimations by Norphel and Tashi (2015) that irrigated plots are flooded with 2–5 cm of water.

To determine reservoir locations in relation to glaciated and irrigated areas, Sentinel 2 imagery from 2017 was classified. Furthermore, the snow line elevation (SLE) was delineated using MODIS data products (2000–2018). Ground truthing of the results from remote sensing analyses was conducted during repeat field surveys (2007–2017). The role of ice reservoirs in the local socioeconomic setting was investigated by interviews with community water managers (*chudpon*), smallholder farmers, representatives of non-governmental organizations (NGOs), government officials, and selected key informants associated with the construction and promotion of "artificial glaciers."

Study area

Physical setting and the cryosphere

The upper Indus Basin of Ladakh is a high-altitude desert, situated between the Greater Himalayan Range to the south and the Karakoram Range to the north. It forms the westernmost part of the Tibetan Plateau at an altitude of over 3000 m, with surrounding mountain ranges exceeding altitudes of 5500 m. Due to its location in the rain shadow of the Himalayan and Karakoram ranges, the region is characterized by cold-arid conditions with an average annual precipitation of approximately 100 mm in Leh (India Meteorological Department 2011) and with occasional torrential rainstorms, such as the extreme cloudburst in August 2010 (Thayyen et al. 2013). Most precipitation falls during the monsoon period with regular summer snowfall at altitudes above 5000 m, but the influence of western disturbances causes a secondary maximum during winter and pre-monsoon (Chevuturi et al. 2018). Seasonal snow cover characterized by uneven distribution and duration contributes significantly to runoff in spring (Mukhopadhyay and Khan 2015; Gurung et al. 2017).

Taking into account the sparsity of weather stations and lack of detailed historical data for the region, the period after 1995 is characterized by a decreasing trend of average precipitation amounts (Chevuturi et al. 2018). Mean monthly temperature values in Leh show a high seasonal variation of around 25 °C between January (− 7.2 °C) and August (17.5 °C) (India Meteorological Department 2011), reflecting the typical glacio-hydrological regime of a cold-arid catchment (Thayyen and Gergan 2010). Temperatures in Leh show

a slight increase between 1901 and 1979, followed by a short cooling period from 1979 to 1991, and a steep increase from 1991 to 2013 (Chevuturi et al. 2018). However, the inverse relationship between general trends in temperature and precipitation changes is more complex due to high inter-annual variability.

The specific combination of topography and climate contributes to the small size and high altitude of glaciers, almost all of which terminate above 5200 m. While the glaciated area of central Ladakh totals 997 km^2 with more than 1800 glaciers, 79% of them are smaller than 0.75 km^2. A general glacier decrease is evident for the time period between 1969 and 2016, with a high variability across different watersheds, with glaciated area reduction ranging from 0.2 to 0.9% $year^{-1}$ (Schmidt and Nüsser 2017). These results correspond with a study by Chudley et al. (2017) who estimate total retreat of 12.8% for 657 glaciers between 1991 and 2014. Although glacier decrease is not as pronounced as in other Himalayan regions, even small climatic shifts influence water storage and runoff in cold-arid regions, crucial for the functioning of irrigation systems (Barnett et al. 2005; Parveen et al. 2015). Despite their small size, meltwater from these glaciers determines the potential for irrigated crop cultivation. Consequently, tributaries without glaciated valley heads are especially susceptible to water scarcity in summer when seasonal snow cover has melted. Permafrost occurrence can be assumed in the upper catchments (Gruber et al. 2017); however, the actual contribution of local permafrost thaw to runoff remains uncertain.

Socioeconomic setting and irrigation practices

Located in the Indian State of Jammu and Kashmir, Ladakh is sparsely populated and has a total of about 274,300 inhabitants (Leh and Kargil districts), with the registered population expanding by 1.5% annually between 2001 and 2011 (Census of India 2011). However, this does not include the large but uncertain number of army personnel and seasonal migrants to the region. Ladakh is a geopolitically sensitive region with contested boundaries and heavy military presence (Baghel and Nüsser 2015; Gagné 2017). The Indian Army and associated institutions are major economic actors, providing employment, maintaining transport infrastructure, health services, and bringing in food supply. Irrigated agriculture continues to be a major, albeit declining, source of livelihood and food security (Dame and Nüsser 2011). Irrigated areas and scattered settlements in central Ladakh are only found along the Indus, on alluvial fans, or tributary valleys between 3200 and 4370 m. Due to the short growing period, central Ladakh is a single-cropping area with barley and wheat as important staples, complemented by vegetables, pulses, and oil seeds. Potatoes, having a slightly longer growing period and higher water demand, are cultivated for household consumption and increasingly as cash crops in recent years. Depending on altitudinal position, irrigation with complete flooding of fields (approximately 2–5 cm water column) starts between March and April prior to the melting of high-altitude glaciers, with additional delay following extended cloudy periods. Further, the unreliability and the foreseen decrease of seasonal snow cover (Chevuturi et al. 2018) increase the precariousness of the water storage function of the cryosphere, especially in spring. In order to cope with recurrent water scarcity, water harvesting technologies and community arrangements have been developed. These include the *zing*, which are small ponds in close proximity to the cultivated fields, where water is collected temporarily for irrigation. Other traditional water storage techniques include small barrier walls for "snow harvesting" in the upper catchments (Dawa et al. 2000). Distribution of meltwater and maintenance of infrastructure is supervised by a *chudpon*.

Results

Types of ice reservoirs

Over the past 30 years, 14 seasonal ice reservoirs have been constructed in central Ladakh, located in tributary valleys north of the Indus (Fig. 1). Usually situated around 1100 m below the glaciers at elevations where snowmelt starts end of March, these structures facilitate the freezing of stream water during winter at selected sites, usually shaded by surrounding mountains. However, three of these structures are located in watersheds without glaciated valley heads (Table 1). There are four distinct types of ice reservoirs with site-specific modifications: the first type is built as cascades on perennial streams. A series of loose rock walls in the river bed reduces flow velocity, but still lets water pass through. Such cascades allow flowing water to freeze on exposed surfaces and form superimposed ice layers when temperatures drop (Fig. 2). This design was used for the oldest structure explicitly called "artificial glacier" in Ladakh, built in 1987 at a favorable location between 4290 and 4640 m in Phuktse. However, according to oral history and Corona imagery from 1969, the first ice reservoirs of this design type are older than 50 years and can be found in Phuktse and Igoo. In February 2014, Phuktse was a successful cascade with an almost complete continuous stretch of ice, with no dry or empty areas (Fig. 3).

The second type diverts water from streams with higher flow velocity to small side valleys, shaded by surrounding mountains. This design allows to integrate higher slope positions for additional ice formation such as the ice reservoir above Nang, completed in 1999 (Fig. 4). It consists of a series of six partially cemented stone walls across the stream bed measuring approximately 3 m in height and 1 m in width.

Table 1 Ice reservoir parameters with population, irrigated area, glaciated area, watershed area, and snow line elevation (SLE) in spring

Village	Pop.[a]	Ice reservoir				Irrigated area				SLE [g]	Glaciated area		Watershed
		Type[b]	Elevation range (m a.s.l.)[c]	Area (km²)	Volume (m^3)[d] normal / optimal	Cropped area (km²)[a]	Total area (km²)[e]	Maximum elevation (m a.s.l.)[c]	Potential irrigation cycles by ice reservoirs[f]	8 March 8 April 16 April (m a.s.l.)	Total area (km²) [e]	Minimum elevation (m a.s.l.) [c]	(km²)[c]
Phuktse, Shara	905	D	4290-4640	0.151	25,420 / 81,040	1.65	3.25	4350	0.31-0.77 0.98-2.45	4310 4520 4875	2.97	5400	84.34
Igoo	1103	BCCD	4230-4570	0.137	29,560 / 88,810	1.51	3.07	4370	0.39-0.98 1.18-2.94	4021 4353 4553	0.82	5370	119.68
Sakti, Chemre	7940	C	4210-4280	0.026	4380 / 13,950	4.63	9.97	4160	0.02-0.05 0.06-0.15	3877 4166 4514	0.61	5430	195.73
Nang	341	D	3870-3900	0.006	1010 / 3220	0.53	1.21	3880	0.04-0.1 0.12-0.3	3778 4266 4437	—	—	50.41
Stakmo	no data	BD	3930-4190	0.001	6630 / 10,820	n.d.	1.41	3850	0.31-0.77** 0.98-2.46**	3804 4088 4329	0.03	5350	62.09
Saboo	1233	D	4190-4300	0.051	8590 / 27,370	1.33	2.81	4120	0.13-0.32 0.41-1.03	3800 4131 4392	0.33	5410	70.72
Leh (Gangles)	30870	B	3980-3990	0.004	3660 / 9160	n.d.	7.36	3940	0.02-0.05** 0.05-0.12**	3794 4129 4351	1.03	5330	142.00
Phyang, Phey	2367	I	3570	<0.001	150*	2.54	5.41	4100	no data	3848 4184 4354	1.96	5250	114.85
Taru	442	B	3900-3920	0.005	4950 / 12,370	0.6	0.92	3900	0.16-0.41 0.27-1.03	3800 4215 4492	—	—	55.11
Umla	99	C	4320-4350	0.003	510 / 1610	0.12	0.33	4010	0.08-0.21 0.27-0.67	3585[u] 4294 4465	—	—	31.84

[a] Population data according to Government of Jammu and Kashmir - Ladakh Autonomous Hill Development Council Leh. 2015. Blockwise Village Amenity Directory 2014–2015 (unpublished)

[b] Ice reservoir types: *B* basin, *C* cascade, *D* diversion, *I* ice stupa

[c] Elevation and watershed area derived from ALOSDSM (© JAXA)

[d] Volume of water storage in ice reservoirs modeled from field measurements; *in case of the ice stupa: information by Sonam Wangchuk; in case of basin structures: assumption of ice fill heights between 1 and 2.5 m

[e] Area derived from Sentinel 2A-data (2017-08-28)

[f] Potential irrigation cycles by ice reservoir volume: assuming that fields are flooded with 2–5 cm of water; upper range represents unfavorable years and cases, lower range represents optimal conditions; **calculated by mean average ratio irrigated to cropped area

[g] Snow line elevation (SLE) derived from MOD10A2 product and ALOSDSM (© JAXA)

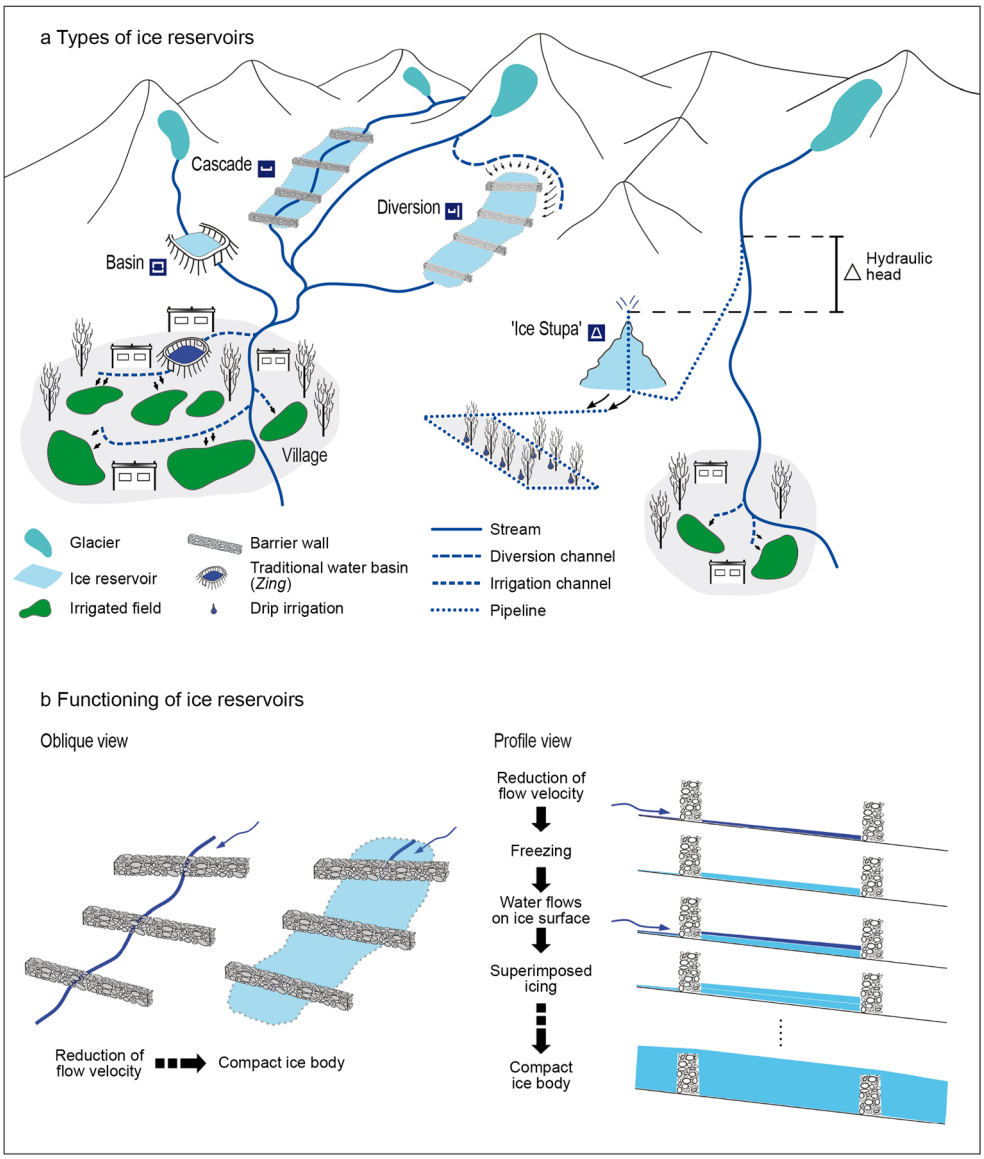

Fig. 2 Ice reservoirs. **a** Different types. **b** The process of ice accumulation

Their length varies between 7 and 17 m. The water for the ice reservoir is obtained through a 1 km long diversion channel, prone to recurring problems of sedimentation, erosion, and frequent freezing in winter, which prevents regular water flow.

The third ice reservoir type is a basin structure, resembling the traditional *zing* form of water storage, but located above the cultivated fields. An early example can be found at Igoo, where embankments already existed in 1969, as witnessed by satellite imagery and interviews. This ice reservoir was further expanded after 2000 and completed in 2013. Another such structure in Gangles, along the road to Khardung La, is of importance for the urban agglomeration of Leh. Completed in 2016, it comprises a basin with controls for inflow and outflow, adjacent to a stream which is allowed to flow during the summer but whose water is diverted to the basin in autumn. The structure consists of stone walls of approximately 2.5 m height, stabilized by gabions (wire cages) and concrete pillars.

The fourth and the newest type of ice reservoirs is the vertical "ice stupa" in Phyang, initiated in 2015, whose name refers to the conical form of Buddhist stupas. High-density plastic pipes, buried in earth to prevent freezing, divert water by gravity from the upper stream area to preferred locations, using the hydraulic head, produced by the altitudinal difference between intake and outflow. There, a narrower vertical pipe with a sprinkler fixed on top sprays out a fountain of water due to hydrostatic pressure which freezes on contact with cold air. The ground is previously plastered with clay to reduce its permeability and to prevent rapid seepage during the melting phase in spring. Branches of seabuckthorn and barbed wire are laid around the initial structure to provide additional surfaces for ice aggregation. One advantage of this ice reservoir type is that its conical shape reduces the surface

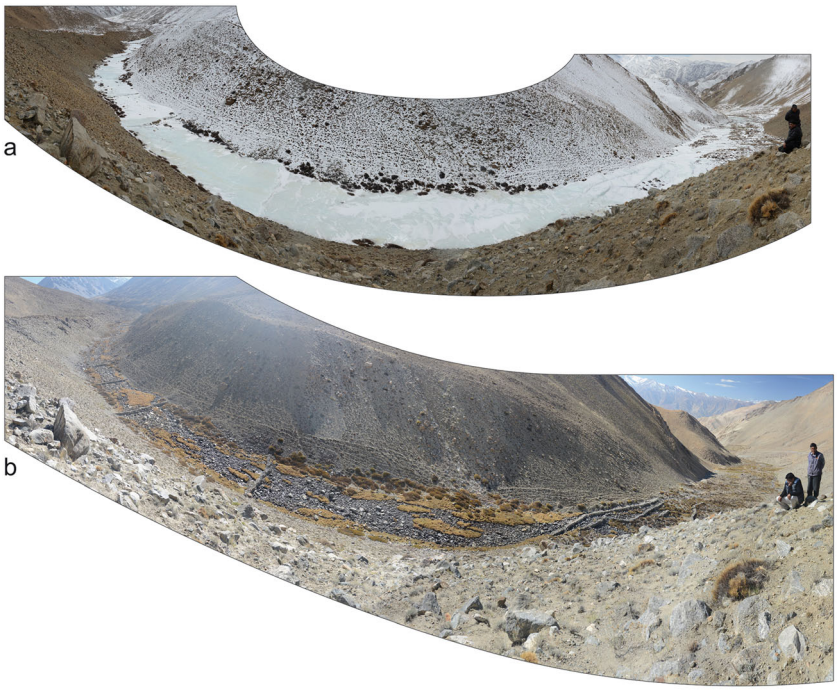

Fig. 3 Ice reservoir of Phuktse, viewpoint 4430 m. **a** February 2014. **b** October 2014

receiving direct solar radiation, thereby slowing down the melting process.

Efficacy of ice reservoirs

High inter-annual climatic variability, frequency, and duration of freeze-thaw cycles together with variances in design result in great differences in ice accumulation among investigated structures (Fig. 5). Flash floods, landslides, erosion, and sedimentation are recurrent problems, so that many ice reservoirs are frequently dysfunctional, like those in Igoo and Saboo after the 2010-flood. Whereas ice accumulation occurred in most years in the cascading reservoirs above Phuktse and Igoo, the structure above Sakti was less efficient in producing a reliable store of ice. In the latter case, ice accumulation in winter often did not last until spring during the observation period (1990–2017). The majority of diversion-type reservoirs which are generally prone to early or untimely freezing of channels or pipes showed only fragmented ice accumulation and snow cover, whereas one above Saboo exhibited successful ice accumulation in most years. The ice reservoir above Nang, being in use since winter 1999/2000, showed regular ice formation only after 2014. While imagery from 2014 and 2015 indicates ice formation, ground surveys and repeat photography reveal large differences in ice volume. According to SfM photogrammetry, the ice volume in winter 2014/15 reached only about 1100 m^3. This estimation is considered as an example of unfavorable ice formation, as the potential storage volume is

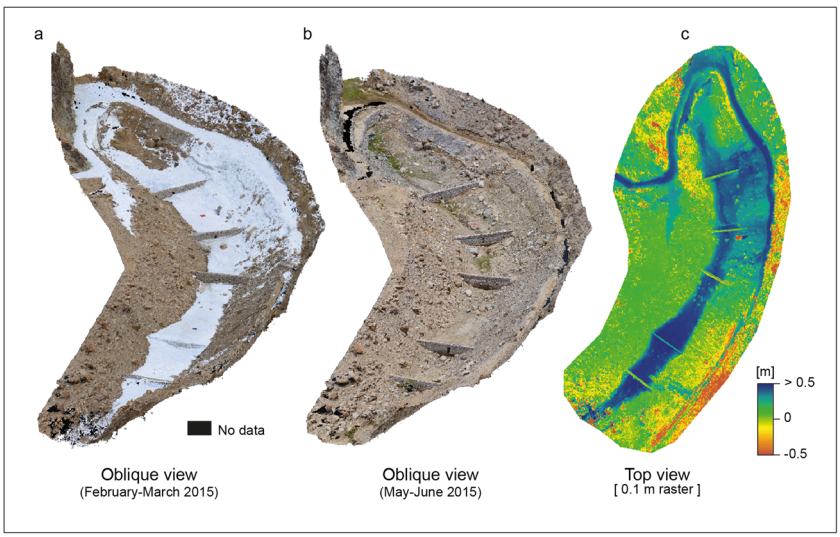

Fig. 4 Ice reservoir of Nang based on structure from motion (SfM)-data taken in 2015. **a** Winter, **b** summer, and **c** difference (winter minus summer) model

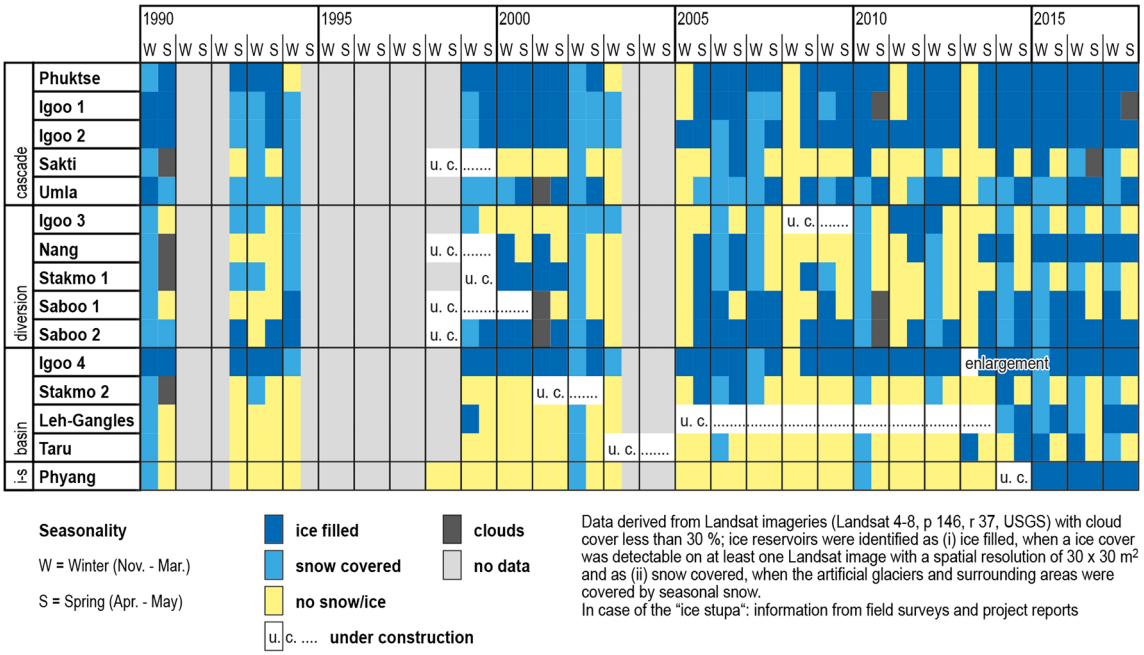

Fig. 5 Efficacy of ice reservoirs in central Ladakh from 1990 to 2017. November is the time when ice starts filling in and spring, when it is required for addressing seasonal water scarcity

estimated to be about three times more (Fig. 4, online supplement). During a field visit in February 2014, the extent of ice formation in this as well as in other reservoirs was almost optimal. The basin structure above Igoo, the oldest of its kind, also proved to be successful over the entire observation period. Likewise, the Gangles basin, a basin structure with diversion, was effective in the last few winters. The derived irrigation cycles show a large variation between catchments. Only under optimal conditions, all fields can be irrigated with runoff from ice reservoirs in five catchments. In Igoo, where four reservoirs cover a total area of 0.137 km^2, 1.18–2.94 additional irrigation cycles are possible. In contrast to this, even under optimal conditions less than 30% of cropped area can be irrigated in Nang, Sakti, and Leh (Table 1).

In the case of the vertical "ice stupa" in Phyang, ice formation could be accomplished, although not always with the desired volume. After a prototype study in winter 2013/2014, a larger "ice stupa" was created in 2015, where the ice body reached a maximum height of about 19 m by the end of March. In 2016, only reduced ice formation was possible due to frozen pipes preventing constant water flow. Water stored in this ice reservoir is used for irrigation of barren land, where a forest of 5000 poplars was planted. The decentralized character of this design type with flexible installations, little space requirement and locations in close vicinity to settlements and fields are further advantages. The designer, Sonam Wangchuk, estimates a volume equivalent to 150 m^3 of water could be stored as ice. However, the lack of irrigation later in the year once the ice reservoirs have melted is likely to be problematic for long-term success of forest plantation.

Support, participation, and perceived benefits

Availability of funding and actor constellations have a great influence on the location and type of ice reservoirs. The ice reservoir in Phuktse was designed in 1987 by Chewang Norphel, a civil engineer, who as the "Glacier man" (Vince 2009) became central in the framing of "artificial glaciers" as an appropriate tool to cope with water scarcity. While the first ice reservoirs were implemented through government agencies, the majority of constructions were realized after 1995 under the umbrella of the national Watershed Development Programme (WDP) and implemented by local NGOs. More recent initiatives include the Indian Army goodwill programme *Sadbhavana*, e.g., in Igoo 2008/2009, and corporate donations. The estimated costs of an ice reservoir vary between 300,000 and 1,000,000 Indian Rupees (INR, approx. 4600 to 15,330 USD in 2018; Interviews in 2014 and 2015), although lower costs of 70,000 INR are reported for the case of Nang by NGO officers. The ice reservoir at Igoo, constructed under the *Sadbhavana* scheme, is the second most expensive project so far. The higher costs were due to the need of road extension to reach construction sites above 4200 m. The most recent reservoirs in the form of "ice stupas," designed by the Ladakhi engineer and politician Sonam Wangchuk and implemented by the NGO SECMOL (Students' Educational and Cultural Movement of Ladakh) co-founded by him, on lands belonging to Phyang monastery, were even costlier. International crowdfunding efforts for their construction were successful in obtaining 125,000 USD by promoting these structures in the context of global climate change. This

amount is several times as much as the total amount of donations received for the construction of earlier ice reservoirs. Similar to Chewang Norphel, Sonam Wangchuk has received a high level of attention by international media.

The building of ice reservoirs by NGOs relies on the participation of village communities in construction and maintenance. Ideally, the villagers as beneficiaries are also involved in project planning, when their site-specific knowledge is needed. However, the degree of participation in decision-making varies between villages and also depends on the project and funding schemes. According to interviews with villagers in 2015, the *Sadbhavana*-funded projects showed a significantly lower level of community participation, whereas the vast majority of households were actively involved in decision-making in projects funded under the WDP. Insufficient integration in decision-making during project planning and implementation may result in lack of ownership and limited responsibility of villagers for maintenance and reconstruction after floods. According to an NGO representative, another reason for the limited spread of ice reservoirs is that people look for government support. Even where, as in Nang, structures have been built professionally using hired labor, the villagers are responsible for regular inspection and maintenance. These tasks include regular removal of debris and ice to ensure free flow in diversion channels in addition to repair of damage arising from floods or grazing yaks. In Igoo, reconstruction following the 2010-floods was only made possible by 275 residents donating their labor for 1 week in October 2013. While daily allowances are provided during the construction phase, funds for maintenance work are not available making local villagers reluctant to contribute their labor.

Construction and maintenance are also hampered by competing seasonal labor requirements for agriculture and better paying off-farm jobs in the tourism sector and administrative services. Further, as a consequence of the reduced importance of agriculture for local livelihoods, there is less interest in maintaining traditional water management institutions and many fields have been abandoned (Nüsser et al. 2012). Those villagers who continue agricultural production are mainly elderly and women with little capacity to repair and maintain the ice reservoir infrastructure. Donation of labor by the army through its goodwill initiative, as in the case of the "ice stupa," redresses labor shortage to some extent. Problems for this ice reservoir also occur from insufficient attention of existing water sharing arrangements between the villages Phyang and Phey, where public opinion towards the "ice stupa" is ambivalent or even hostile. There have been protests against the project as it abstracts water from the main stream, thereby reducing water availability for downstream communities and households (Sharma 2017).

In interviews, smallholders reported benefits from improved water availability in spring as higher crop yields, increased frequency of irrigation, and fewer restrictions on water use by the *chudpon*. Households in Nang mentioned better results for growing potatoes as cash crops. In Igoo, the ability to grow vegetables and trees were perceived as key benefits. Sales of cash crops and timber provide valuable incentives for communities.

Discussion

The combination of remote sensing analyses and field measurements allows to monitor ice reservoirs and to identify natural icing sites, which may inform decisions about potential ice reservoir locations. Depending on the frequency, depth and duration of fluctuations across the freezing point of water (freeze-thaw cycles, Hewitt 2014), icing regularly occurs in upper tributaries with a broad valley floor and gentle slopes on frozen ground. This typical and important hydroclimatic feature of Ladakh has largely been neglected in previous research. Time series indicate that functioning of ice reservoirs does not solely depend on altitudinal position, but also on other topographic parameters such as slope angle and solar radiation. Additionally, the position of the zero degree line in winter and spring needs to be considered.

Whereas superimposed ice can be identified using satellite imagery, volume estimations require close range techniques such as SfM photogrammentry, which is costlier in terms of time and resources. Our results indicate that the ice reservoir volumes differ greatly, mainly depending on interannual variation in winter runoff. An improved understanding of ice reservoir efficacy requires more accurate estimations of climatic and hydrological conditions, including snow cover monitoring and investigations of the role of permafrost. However, these data are still not available for Ladakh and the wider Himalayan region (Gurung et al. 2017). Due to the complex set of variables, the environmental conditions for optimal functioning of ice reservoirs remain uncertain. Extended cloudy periods in spring may result in delayed melting, so that the anticipated increase in water availability is not guaranteed every year. The lack of such data impedes exact assessments of irrigation potential of ice reservoirs. Assuming optimal conditions and neglecting variations in water demands of cultivated plants, our approximation of potential irrigation cycles puts the exaggerated claims and anecdotal accounts over ice reservoirs into perspective. In five catchments, ice reservoirs allow at least one irrigation cycle of cropped area under optimal conditions, based on a water column of 2 cm (Table 1). However, under unfavorable conditions, a complete irrigation cycle can only be achieved in one catchment. In case of cash crop production, which requires higher amounts of water, the potential irrigation area is even further reduced. As agriculture in Ladakh is primarily for subsistence, the high upfront costs

for installing technological improvements to reduce evaporation loss, such as drip irrigation, hamper their implementation in this socioeconomic setting.

However, ice reservoirs can be regarded as appropriate local technology to reduce seasonal water scarcity at critical times. It is remarkable that the practice of building such structures can be traced back at least to the 1960s, possibly much earlier, contrary to contemporary reports. The benefits perceived by villagers include an increase of cash crop production (potatoes) and tree plantations, causing demands for the construction of more ice reservoirs. A comprehensive understanding of water management in Ladakh also needs to consider a number of diverse aspects such as established water sharing arrangements between communities and households, competing labor requirements for agriculture and better paying off-farm jobs and lack of funds for maintenance of irrigation infrastructure. As active participation of local smallholders and adequate solutions for potential resource conflicts are crucial for sustainable land use options, these aspects need to be integrated in research assessments and planning processes.

Although the first "artificial glacier" was constructed in 1987, these structures did not attract much global attention until the late 1990s, when they were presented as a strategy to improve irrigation and benefit farmers (Bagla 1998; Shaheen et al. 2013). However, following the controversy over the impending disappearance of Himalayan glaciers in 2007, "artificial glaciers" were promoted as appropriate climate change adaptation strategies (Vince 2009), though their function as water conservation structures to cope with recurrent water scarcity at the local scale had not changed. Based on our examination and counter to recent claims of the efficacy of "artificial glaciers" in addressing climate change, we believe these structures are unlikely to be effective adaptation strategies. The main reasons for this are they depend upon winter runoff and freeze-thaw cycles; they only serve to reduce water scarcity in spring; they are sensitive to climatic conditions. Therefore, it is important to see them as site-specific water conservation strategies rather than climate change adaptation, which is neither their original function, nor something they are likely to accomplish.

Conclusion

The case of ice reservoirs in Ladakh is an illustrative example of the co-evolution of environmental processes and local livelihoods in a sensitive socio-hydrological system. We think that the term "artificial glacier" is not only inaccurate but also misleading in that it gives the false impression of them being potential replacement for disappearing natural glaciers. Therefore, we propose the term ice reservoir for scientific usage to ensure clarity and accuracy. Although climate change is expected to have considerable impact on meltwater-dependent agriculture in this cold-arid region, the usefulness of ice reservoirs as reliable adaptation strategies to cope with the anticipated reduction of water storage in the cryosphere remains questionable. The main reasons for this assessment include climatic variability, natural hazards and an incomplete integration into the local socioeconomic setting. These different aspects significantly reduce the efficacy of ice reservoirs.

Despite limitations in data availability, our approach of combining research methods from natural and social science improves understanding of the interactions between glacio-hydrological processes and socioeconomic development. These methods are globally replicable for similar mountain regions and can help evaluate the potential transferability of this technology. The integration of local experiences and community-based mechanisms provides a more contextualized and holistic understanding of site-specific adaptation strategies and livelihood vulnerability (Barnes et al. 2013). In this sense, lessons from our Ladakh study are relevant for the Himalayan region and beyond.

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From: Lions Bay Office
To: Lions Bay Office
Subject: FW: Form submission from: Feedback Form
Date: Tuesday, May 11, 2021 10:48:36 AM

From: The Village of Lions Bay <no-reply@upanupstudios.com>
Sent: Monday, April 26, 2021 1:25 PM
To: Lions Bay Reception <reception@lionsbay.ca>
Subject: Form submission from: Feedback Form

SUBMITTED ON MONDAY, APRIL 26, 2021 - 13:25

SUBMITTED BY ANONYMOUS USER: [96.49.63.104]

SUBMITTED VALUES ARE:

FULL NAME TERESA BRANDVOLD
EMAIL ADDRESS [redacted]
YOUR FEEDBACK
I AM SO GLAD TO SEE THE VILLAGE TAKE ON THIS INITIATIVE. IT'S VERY IMPORTANT THAT WE ALL STEP UP IN ANY WAY THAT WE CAN. I WOULD LIKE TO SUGGEST THAT THE COMMITTEE LOOK AT PROVIDING GRANT INFORMATION IN A TIMELY MANNER TO RESIDENTS FOR ANY ASSISTANCE THAT THEY MAY BE ELIGIBLE FOR FROM GOVERNMENTS OR OTHER AGENCIES. (SUCH AS ELECTRIC VEHICLE PURCHASE REBATES; BC HYDRO REBATES FOR HOMEOWNERS ETC.)
THE VILLAGE COULD ALSO PROVIDE LINKS TO HELPFUL SITES LIKE ELECTREK.COM, WHICH IS A SITE WITH A DAILY NEWS FEED OF ALL THINGS SUSTAINABLE, RELATING TO ENERGY CONSUMPTION.
ALSO, THE COMMITTEE SHOULD LOOK AT WAYS TO ENCOURAGE RESIDENTS TO HELP PROTECT OUR POLLINATORS, WHO PROVIDE 30% OF OUR FOOD. A GOOD START THERE CAN BE FOUND ON THE CANADIAN WILDLIFE FEDERATION'S WEBSITE, UNDER "POLLINATORS" AT THE BOTTOM OF THE MAIN PAGE.

THE RESULTS OF THIS SUBMISSION MAY BE VIEWED AT:

[redacted]

HOUSE OF COMMONS
CHAMBRE DES COMMUNES
CANADA

Patrick Weiler
Member of Parliament
West Vancouver-Sunshine Coast-Sea to Sky Country

April 14, 2021

Today, the Honourable Catherine McKenna, Minister of Infrastructure and Communities, announced the launch of the Green and Inclusive Community Buildings program across Canada to support green and inclusive community buildings through retrofits, repairs, upgrades, and new builds.

As part of the Strengthened Climate Plan, the program will deliver $1.5 billion in funding over the next five years to projects that improve the places where Canadians gather, access services, and connect with others in the community, while saving energy, cutting pollution, and offering thousands of good jobs.

The program will invest in projects that meet a minimum threshold for energy efficiency improvements and that increase social inclusion in under-served and high-needs communities across Canada. Projects could include: the installation of energy efficient windows in public libraries; the construction of an Indigenous cultural centre built to green specifications; and, other such projects that would reduce energy waste, improve ventilation and contribute to inclusive community spaces.

Local governments, provincial and territorial governments, and not-for-profit and Indigenous organizations may now apply for funding through the Green and Inclusive Community Buildings program for projects that retrofit or build new publicly-accessible buildings that provide services to the public. At least 10 per cent of this funding will be allocated to projects serving First Nations, Inuit, and Métis communities, including Indigenous populations in urban centres.

Through the Green and Inclusive Community Buildings program, we will continue to work together to build a healthier environment, a healthier economy and more inclusive communities for all Canadians.

For more information about the program and instructions to apply, please visit this webpage. If you have any questions, please do not hesitate to reach out to our office. We stand ready to support your application in any way that we can.

Sincerely,

Patrick Weiler, MP
West Vancouver-Sunshine Coast-Sea to Sky Country

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Forest Enhancement
Society of British Columbia

April 9, 2021

Re: Forest Enhancement Society of BC Accomplishments Update Spring 2021

Dear Mayor Ron McLaughlin and Lions Bay (Village) Council,

Projects funded by the Forest Enhancement Society of BC (FESBC) address a number of environmental, social, and economic priorities of British Columbians. These priorities include protecting communities from wildfire risk, improving wildlife habitat, reducing greenhouse gases, accelerating the expansion of the bio-economy, and enhancing B.C.'s forests for future generations. Forest enhancement projects achieve multiple social, environmental, and economic aspirations of British Columbians. Investing in forests to reduce our carbon footprint, reduce wildfire risks, enhance habitat, and create jobs is a win-win-win on all fronts.

Some of the economic impacts of COVID-19 have been mitigated with support from the provincial government. The Province's ***Stronger BC for Everyone: B.C.'s Economic Recovery Plan*** provided $3 million of additional funding to FESBC to help sustain approximately 100 forestry jobs this past winter to use wood fibre that is normally left behind after logging.

> *"This new funding is part of the government's $1.5-billion economic recovery plan, which reflects our ongoing commitment to help British Columbians deal with challenges posed by the COVID-19 pandemic. The grants will support local jobs and help make better use of wood debris left behind after timber harvesting."*
>
> Hon. Katrine Conroy
> Minister of Forests, Lands, Natural Resource Operations and Rural Development
> Quote from: New grants to help use more food fibre | BC Government News Feb. 1, 2021

The enclosed Accomplishments Update Spring 2021 edition provides a snapshot of how FESBC sustained an estimated 100 forestry jobs to utilize about 233,000 cubic meters of low-value wood (4,600 truck loads) this past winter while at the same time contributing to achieving B.C.'s and Canada's climate change targets. The projects are estimated to avoid 65,000 tonnes of CO2 emissions which is equivalent to taking 13,000 cars off the road for a year.

If you are interested in further information, please visit our website www.fesbc.ca or connect with our Executive Director Steve Kozuki at skozuki@fesbc.ca or 1.778.765.0938

Jim Snetsinger, RPF
Board Chair, Forest Enhancement Society of BC

(007) MC

SIERRA CLUB BC

May 2021

Lions Bay (Village)
Attn: Climate Change Dept.
400 Centre Road
Lions Bay, BC V0N 2E0

To whom it may concern,

We are writing to **invite you to our upcoming webinar** for municipalities, regional districts, Indigenous governments, and other local governance structures to discuss a crucial new report called 'Intact Forests, Safe Communities'. This recently released report highlights the relationship between forest management and potentially devastating climate disasters that are already impacting communities like yours in British Columbia.

Please join us for our webinar, **"Intact Forests, Safe Communities"** to learn how you can protect your community from climate risks such as wildfire, freshwater contamination, landslides and flooding.

Date: June 9, 2021

Time: 2:00 – 3:30 p.m.

Register at sierraclub.bc.ca/safe-communities

We are including in this package the independent report, 'Intact Forests, Safe Communities', which was commissioned by Sierra Club BC and **written by forestry expert Dr. Peter Wood**. The report found that clearcut harvesting can significantly impact the severity and frequency of climate risks for B.C. communities, in particular risks related to wildfire, landslides and floods. In fact, of the 15 climate risks identified in B.C.'s 2019 Strategic Climate Risk Assessment, the majority are influenced by logging.

B.C.'s 2019 Climate Risk Assessment outlined how several of these climate risks have the potential to create catastrophic impacts in coming decades, **especially for municipalities, regional districts, and Indigenous communities.** The provincial assessment did not consider, however, the impact of current logging practices on these climate risks or how improved logging practices can protect communities.

Fortunately, the report also shows that by working together, local, regional, and Indigenous governments can mitigate climate related disasters like **flooding, droughts, fires and heatwaves**. By swiftly protecting and restoring intact forests, working to reform B.C.'s forestry practices, and applying Indigenous knowledge to forest-related decisions, **you can help protect your community.**

To support the health and safety of B.C. communities, it is critical that the BC Climate Preparedness and Adaptation Strategy, now under development, include measures to **protect intact forests and reform forestry practices.** Not addressing the relationship between forestry and climate risks would severely undermine the effectiveness of the Province's response to the climate crisis.

As our report shows, the best way to accomplish this is by implementing all the recommendations from the 2020 Old Growth Strategic Review, a plan that calls for the protection of remaining intact forests and a **paradigm-shift for forest management in B.C**. The Old Growth Strategic Review recommends engaging the full involvement of Indigenous governments during this paradigm shift and calls on the

provincial government to center forest management on ecological integrity and conservation of biodiversity. Implementing these recommendations will create a host of co-benefits, like keeping more carbon stored in forests and **reducing severe risks of climate impacts.**

As you know, Premier John Horgan committed in the fall of 2020 to implementing all the recommendations of the Old Growth Strategic Review; however, seven months later, the B.C. government has yet to implement interim protection for all at-risk forests, provide the necessary funding, or disclose a timetable for how they will live up to this commitment.

As the global biodiversity and climate crises exacerbate, time is quickly running out to safeguard remaining intact forests and their irreplaceable benefits. **Local and regional governments cannot ignore** the growing risks of **status quo forest management** in these unprecedented times, as the costs of climate disasters are often borne by these levels of government.

It is our hope that Dr. Wood's report and our upcoming webinar will provide you with crucial **information your community can use** to speak out about land use and forestry decisions impacting the lands and waters surrounding you, as well as the **potential financial risks your community faces** from climate disasters.

The needed paradigm-shift in forest management cannot be achieved without a new provincial framework supporting communities across the province. **You can help bring about this change** by urging the provincial government to keep its promise and fully implement the recommendations of the Old-Growth Strategic Review panel's report in their totality.

Please join us on **Wednesday June 9th at 2 pm for 90 minutes** for a presentation and conversation with **Dr. Peter Wood,** Sierra Club BC's Forest Liaison **Robin Strong** and **Jens Wieting**, Senior Forest and Climate Campaigner at Sierra Club BC.

More information and registration can be found at: **sierraclub.bc.ca/safe-communities**

Please let us know if you are interested in our webinar, if you have questions or concerns or if you would like to receive information about climate risks and opportunities for the change we need to thrive in the future. We have additional paper copies of the report which we can provide if you need. Thank you.

Sincerely,

Robin Strong
Forests Community Liaison
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robin@sierraclub.bc.ca

Jens Wieting
Senior Forest and Climate Campaigner,
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